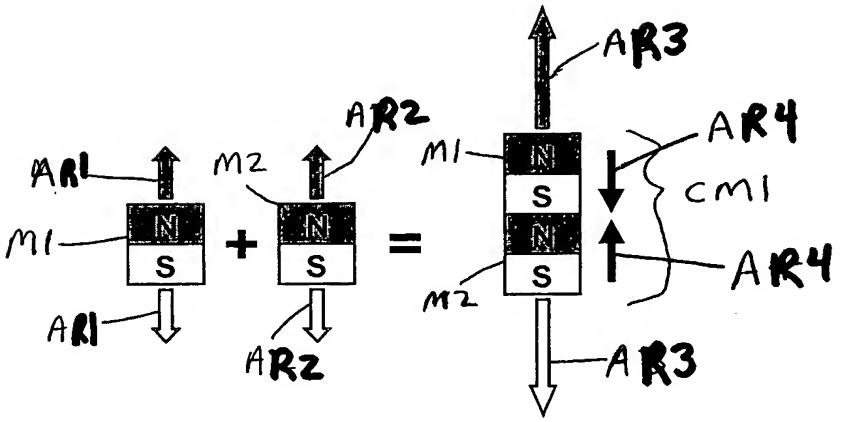


FIG. 1

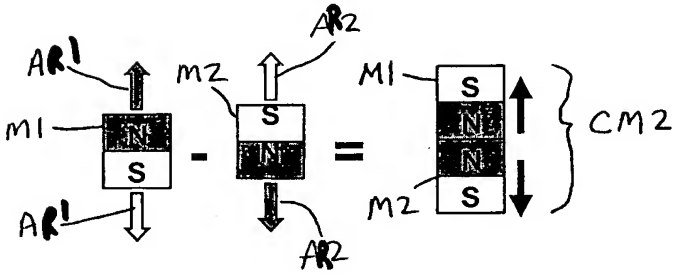


FIG. 2

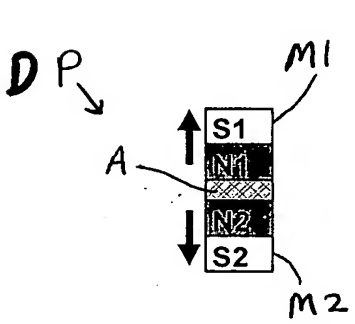


FIG. 3A

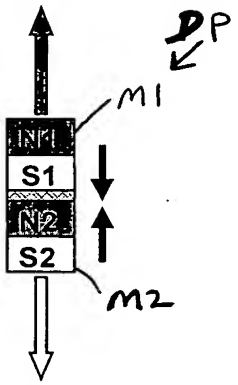


FIG. 3B

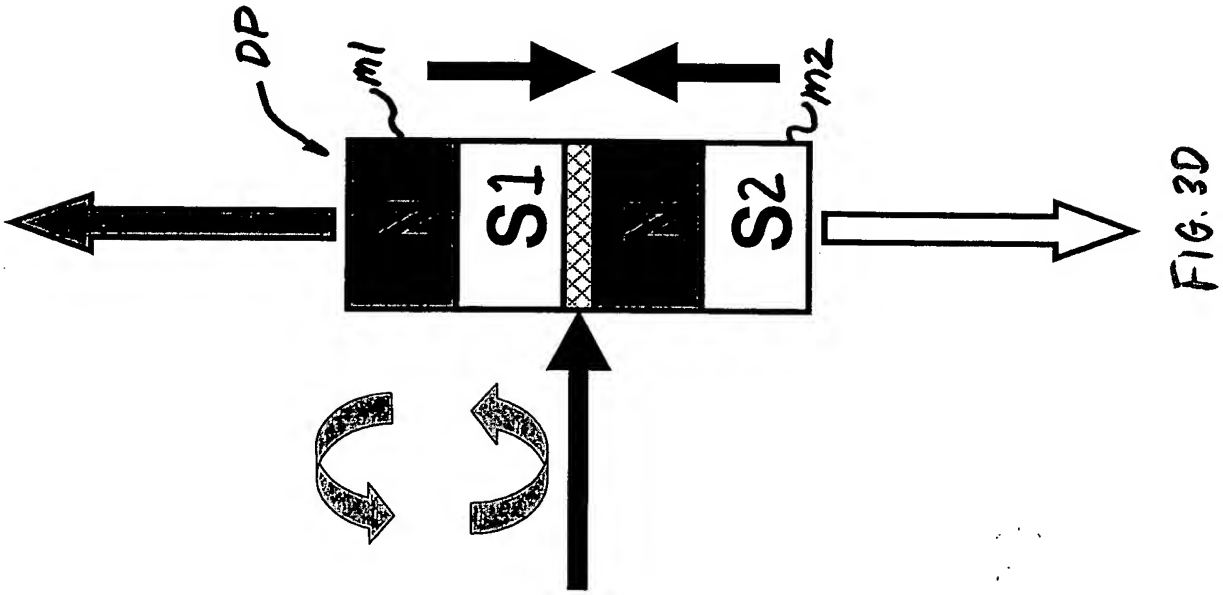


FIG. 3D

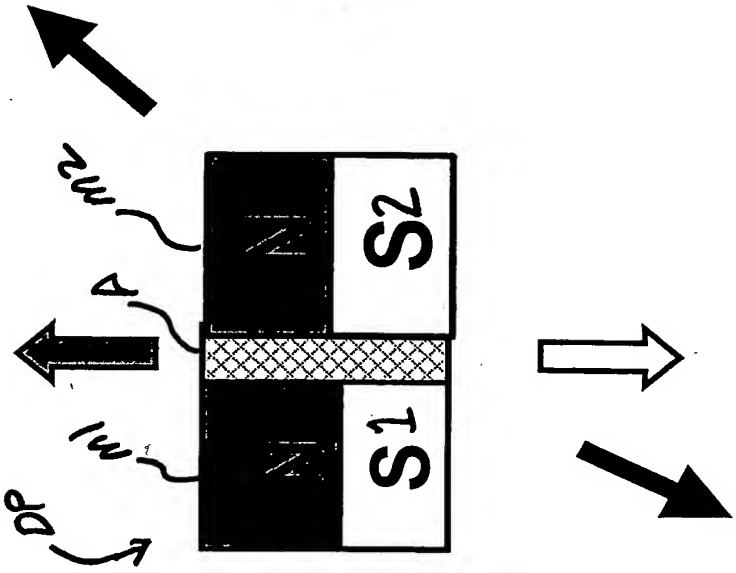


FIG. 3C

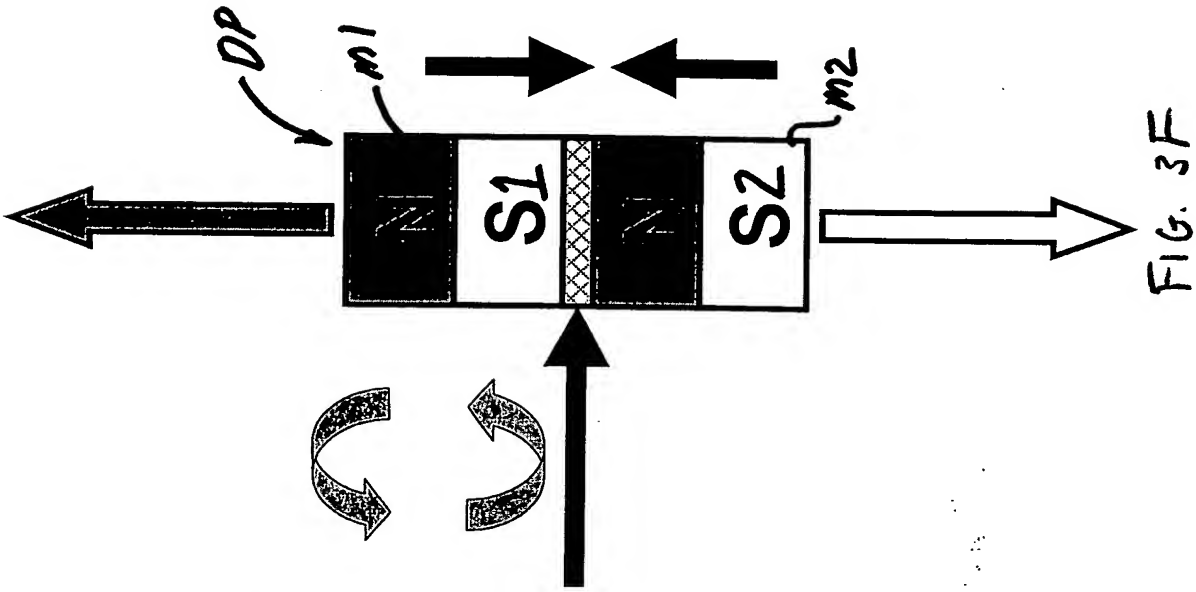


FIG. 3F

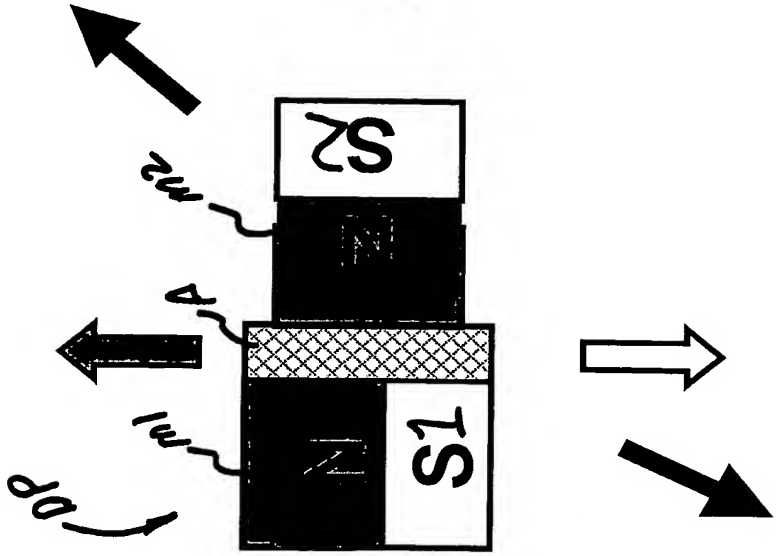


FIG. 3E

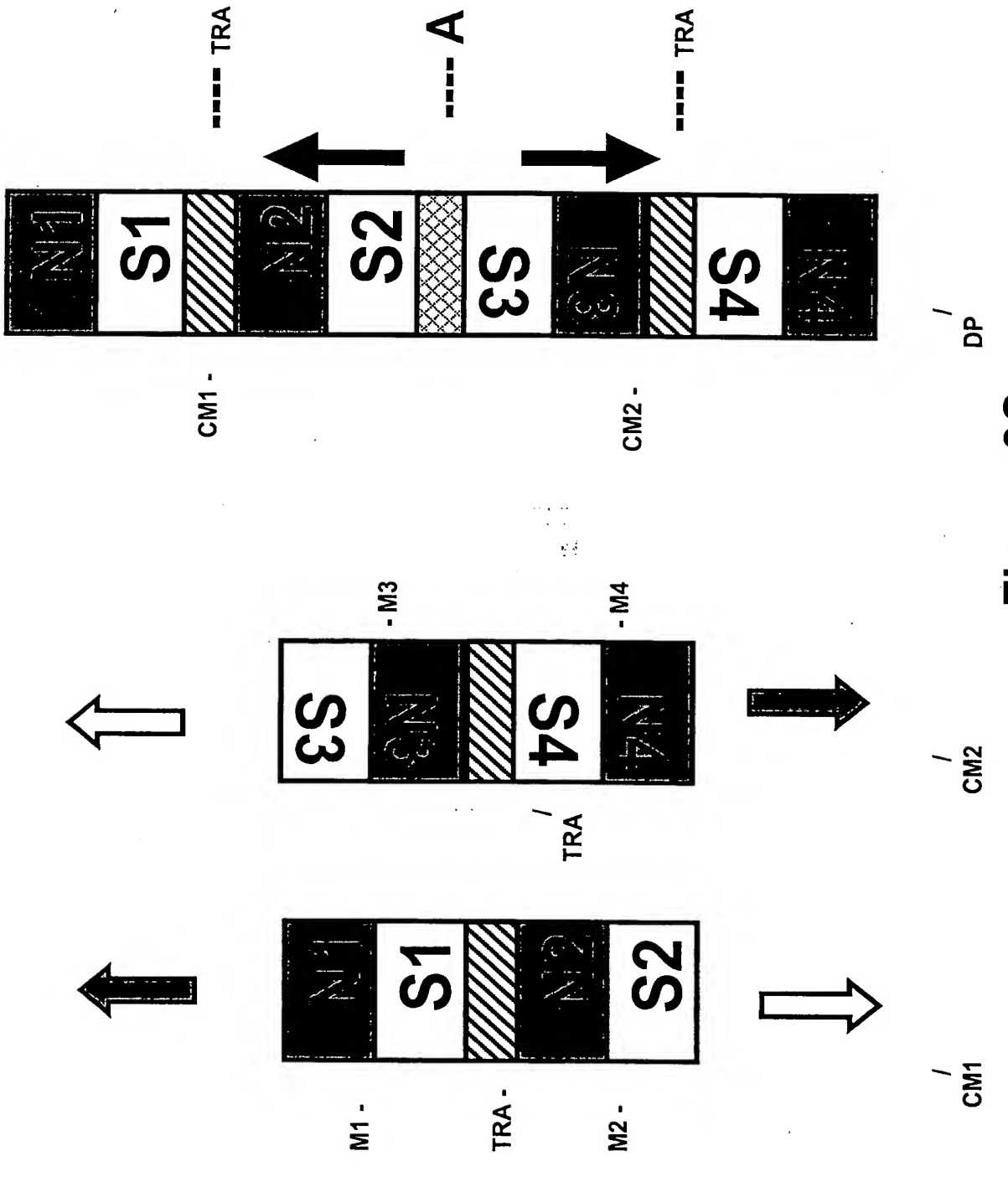


Figure 3G

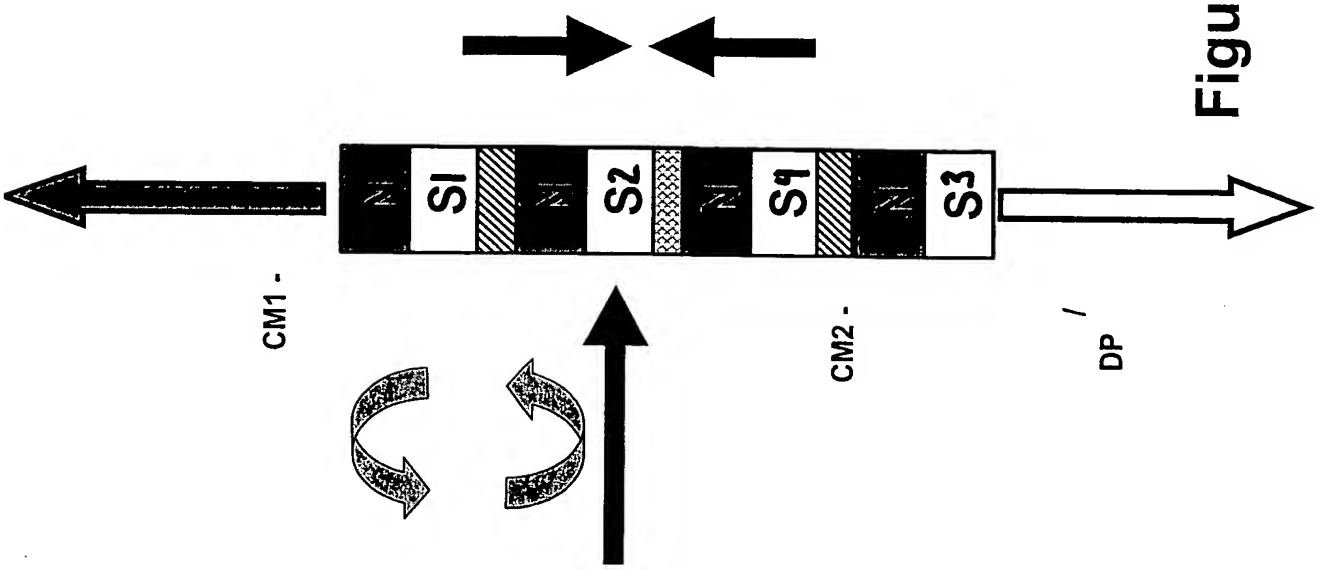


Figure 3I

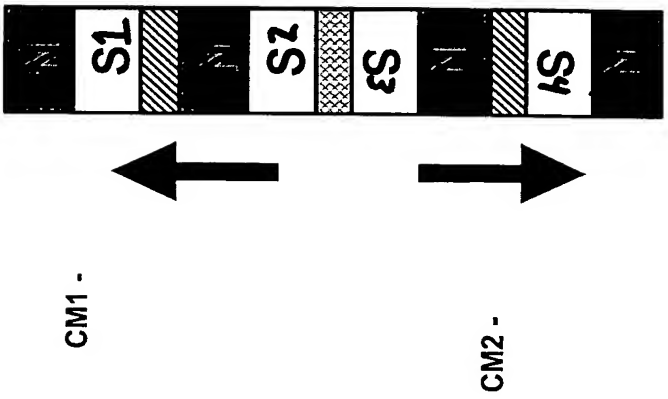


Figure 3H

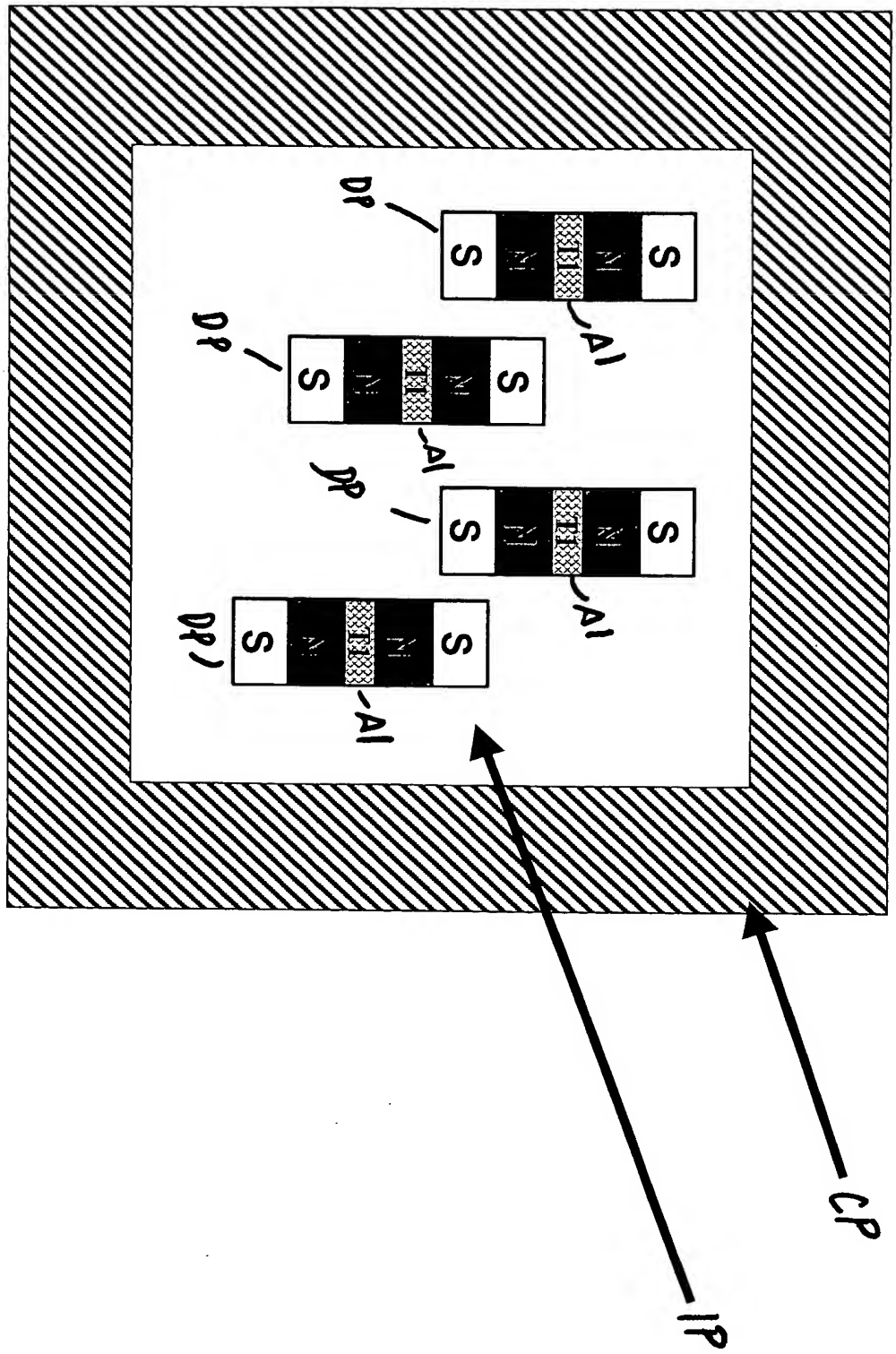


Figure 3J

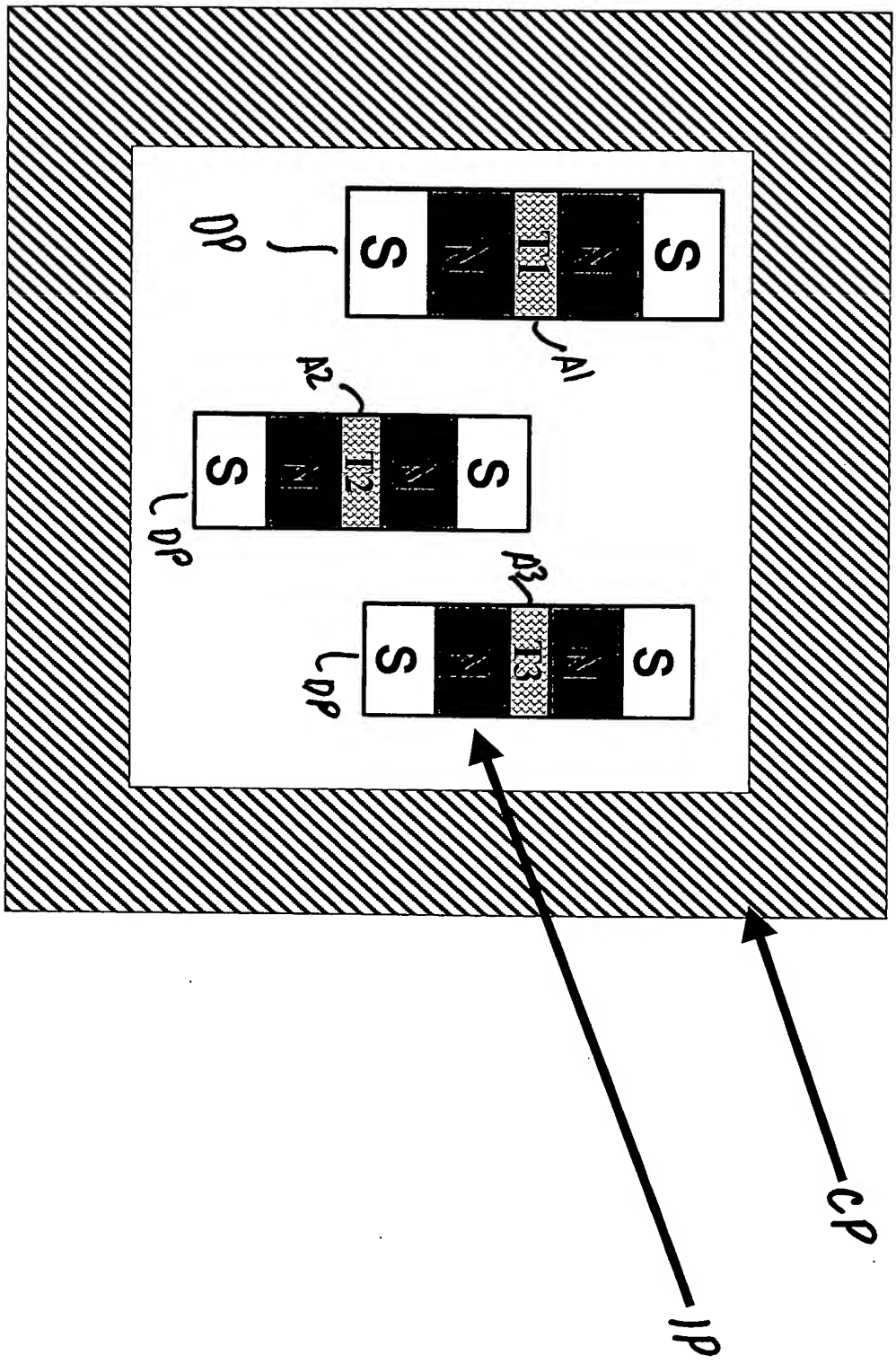


Figure 3K

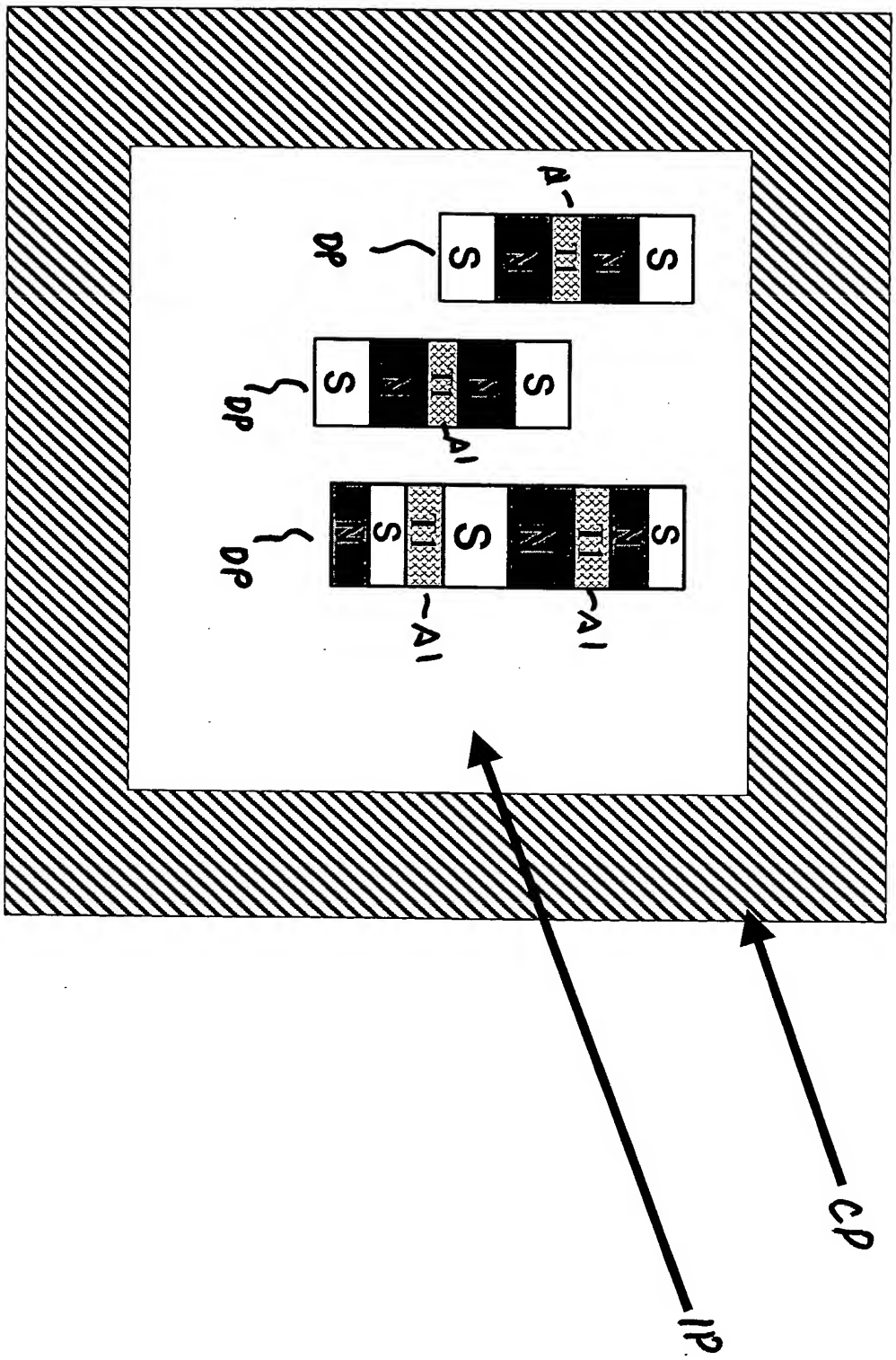


Figure 3L

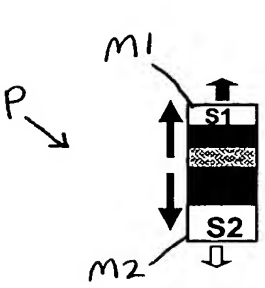


FIG. 5A

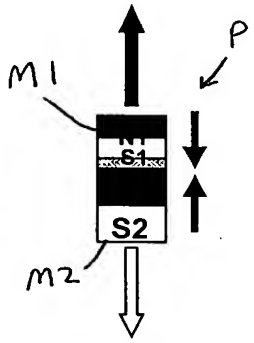


FIG. 5B

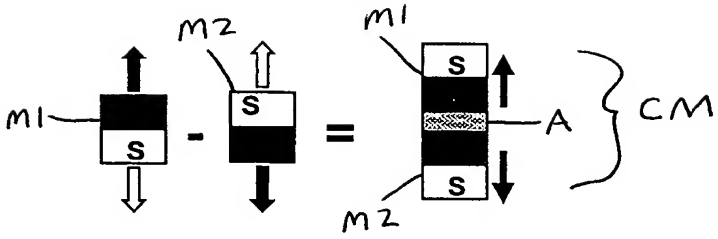


FIG. 4

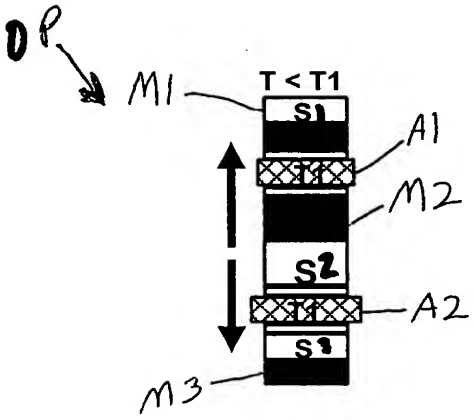


FIG. 6A

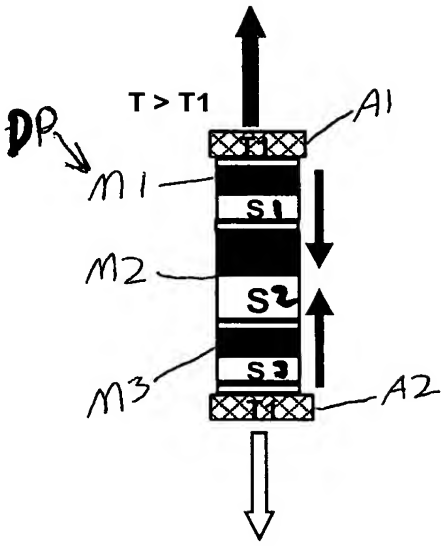


FIG. 6B

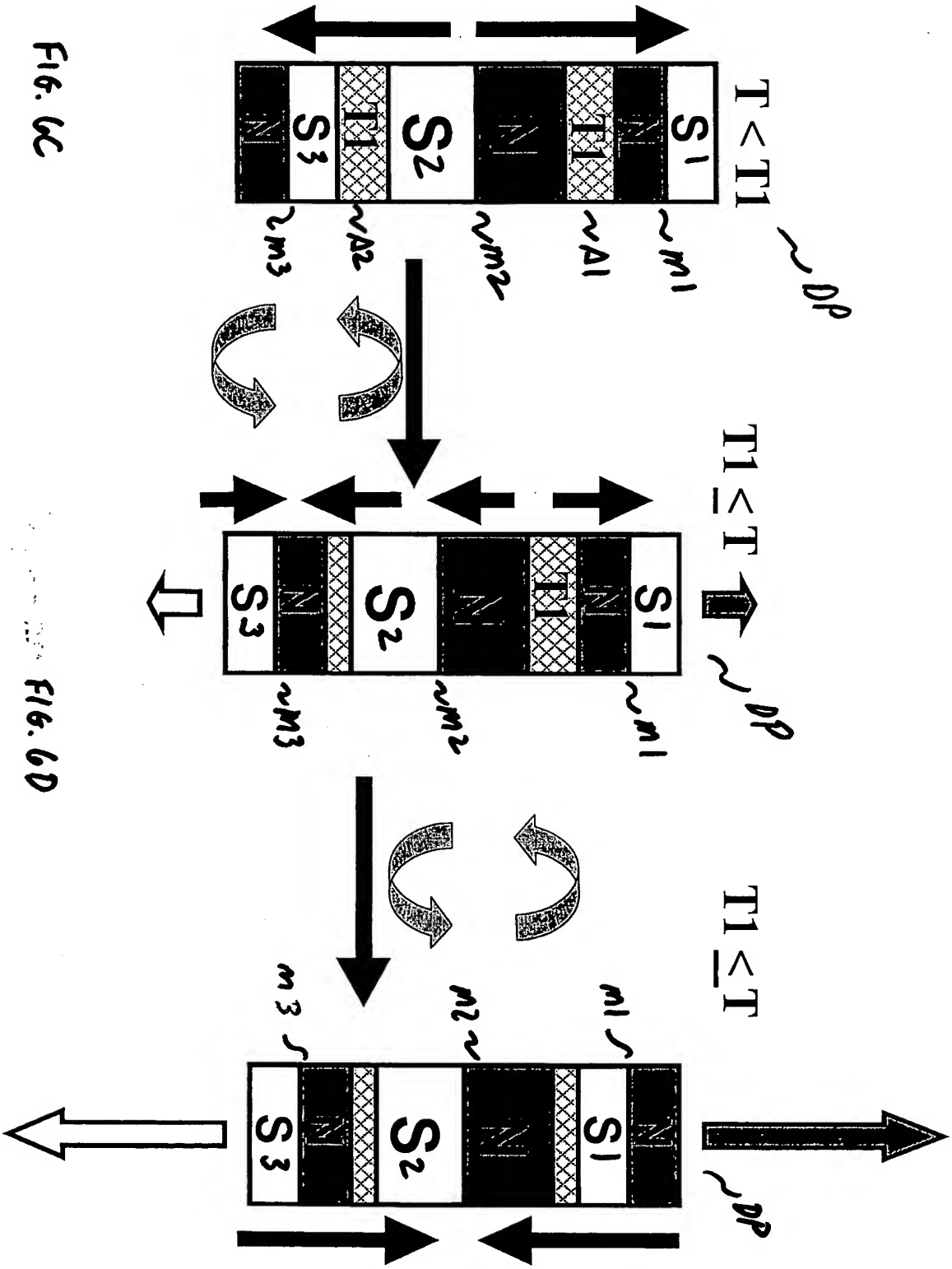


FIG. 6C

FIG. 6D

FIG. 6E

Title: Methods, Systems, and Devices
for Evaluation of Thermal Treatment
Inventors: Palazoglu et al.
Attorney Docket No. 297/164/2

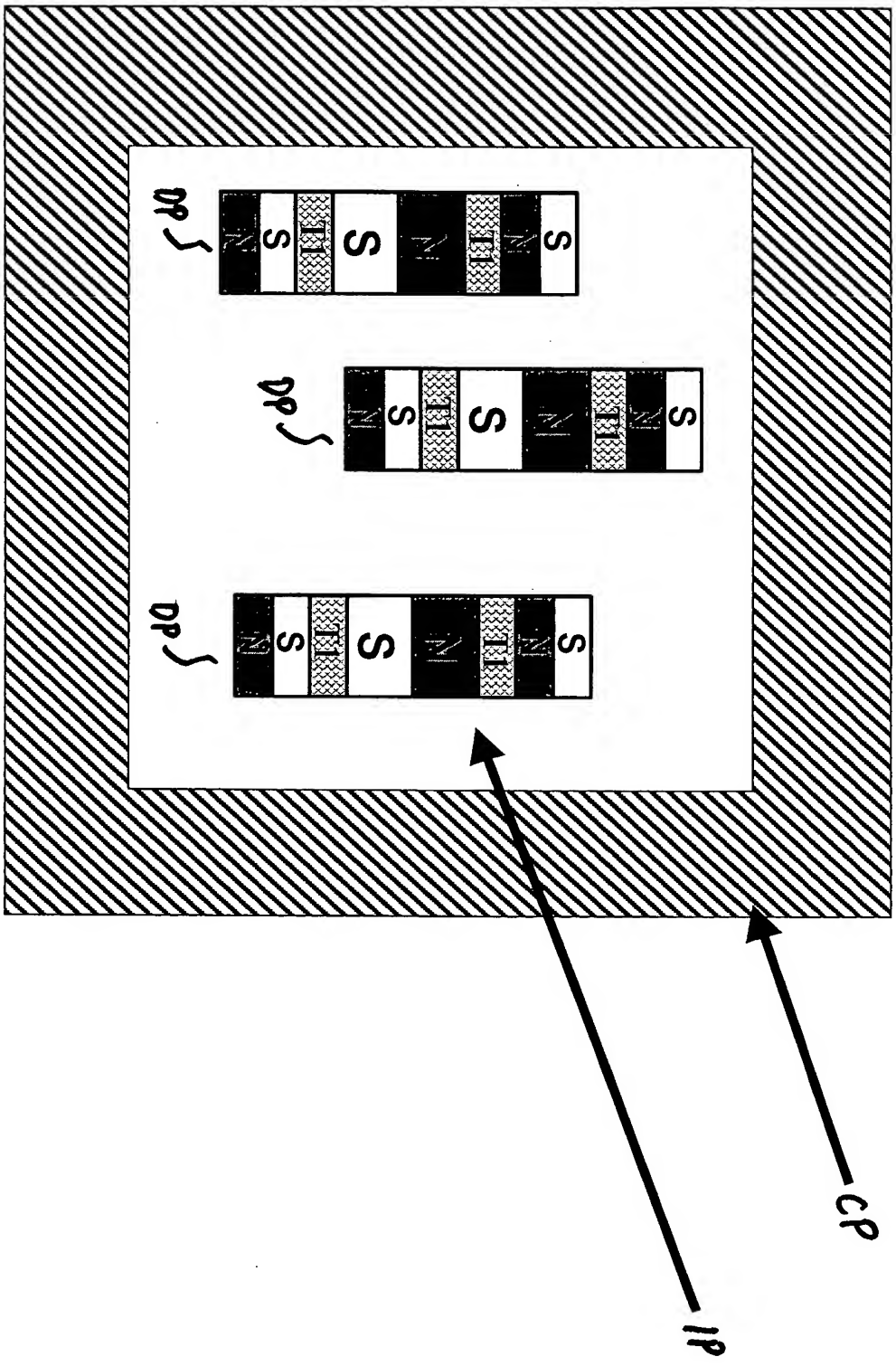


Figure 6F

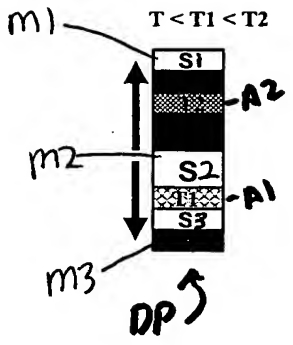


FIG. 7A

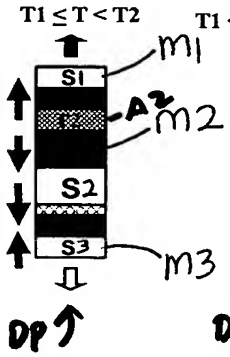


FIG. 7B

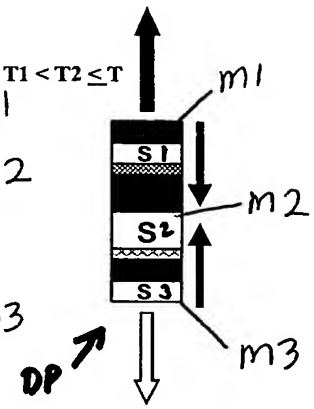


FIG. 7C

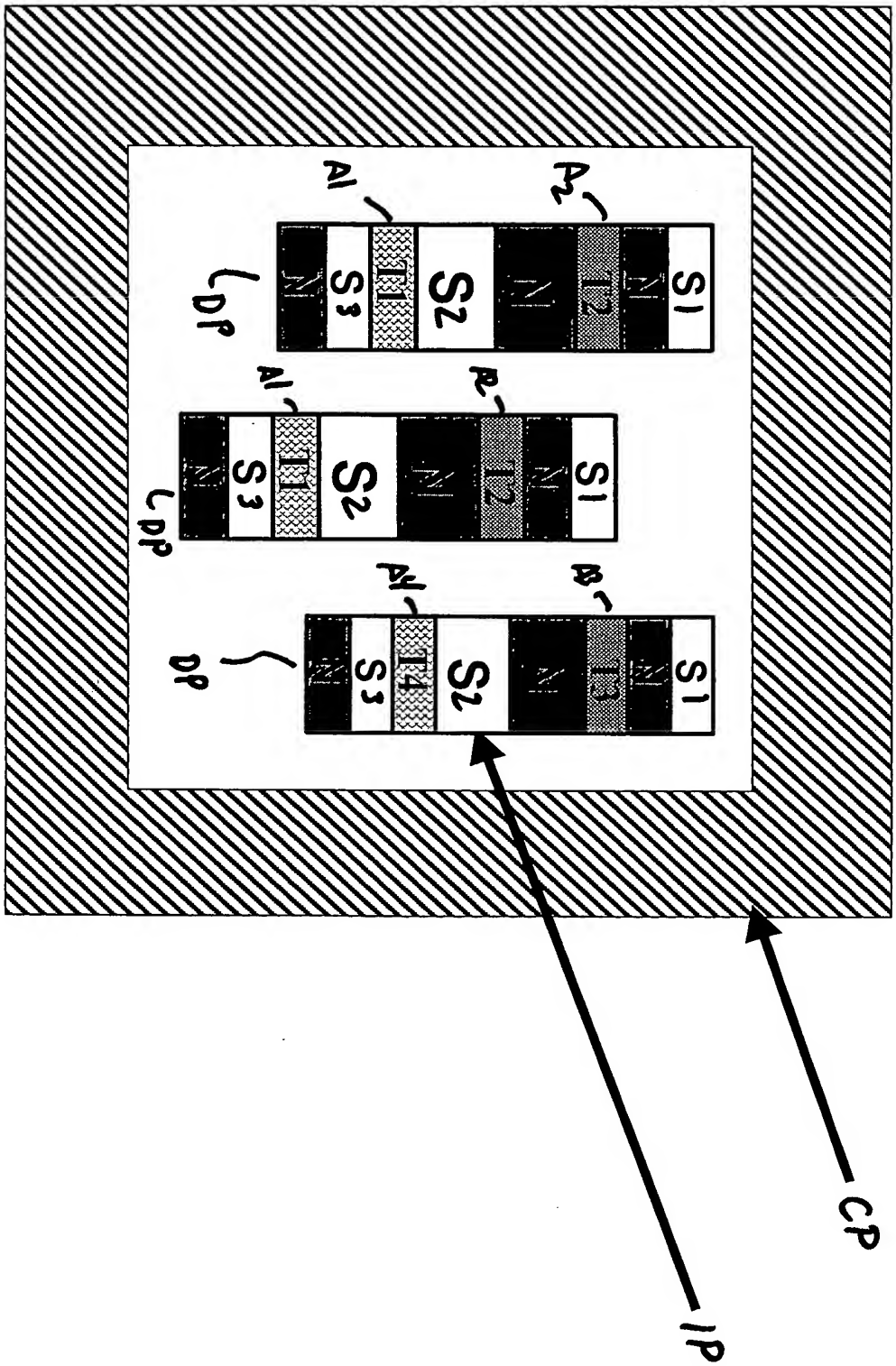

A1
A2
S3
L1
S2
L2
S1
DP
A1
A2
S3
L1
S2
L2
S1
DP
A1
A2
S3
L4
S2
L3
S1
DP
IP
CP

Figure 7D

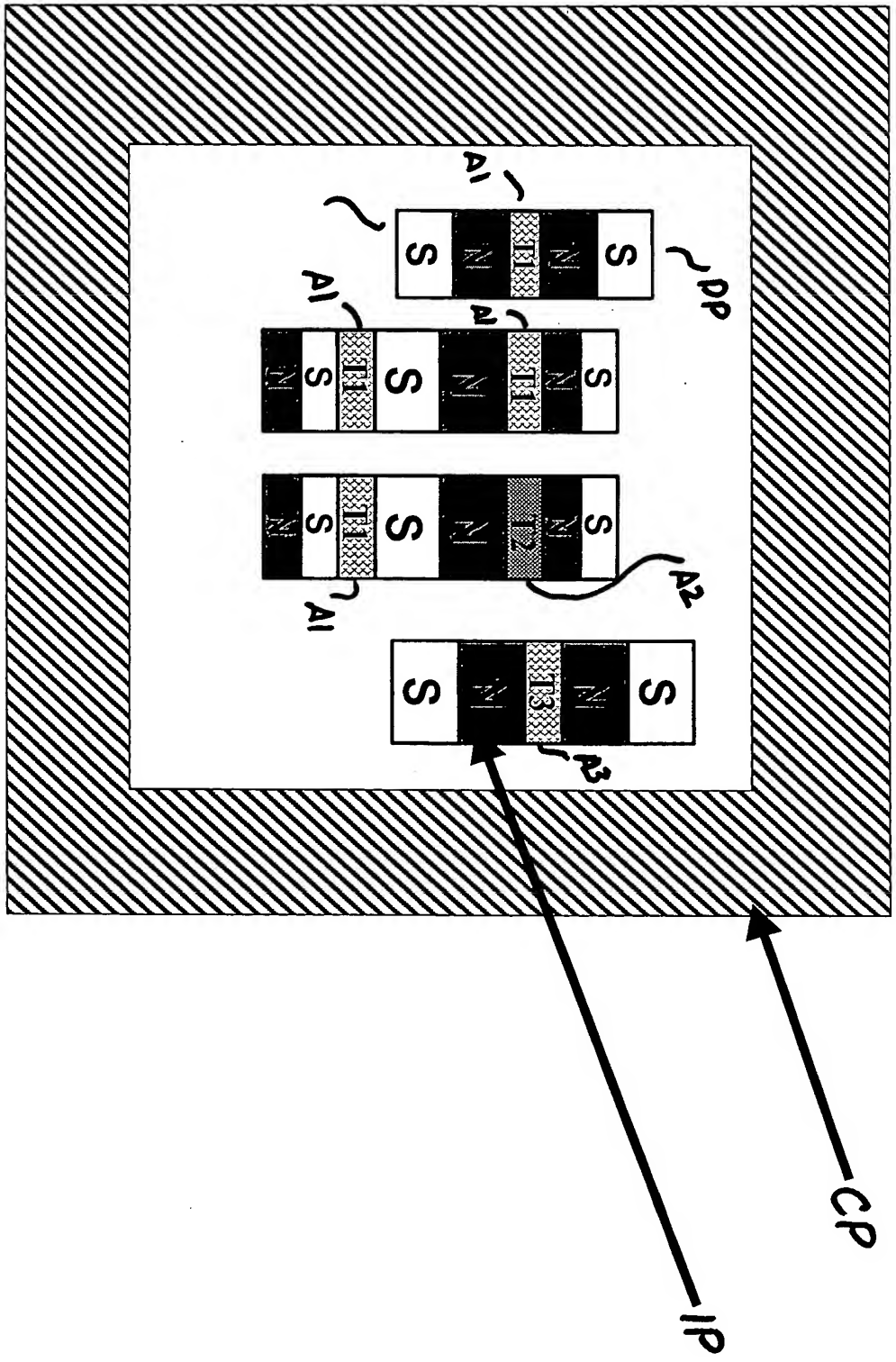

A1
S
N
T1
N
S
DP
A1
A2
S
N
T1
S
N
T1
N
S
S
N
T1
S
N
T2
N
S
A2
A1
S
N
T3
N
S
A3
IP
CP

Figure 7E

Title: Methods, Systems, and Devices
for Evaluation of Thermal Treatment
Inventors: Palazoglu et al.
Attorney Docket No. 297/164/2

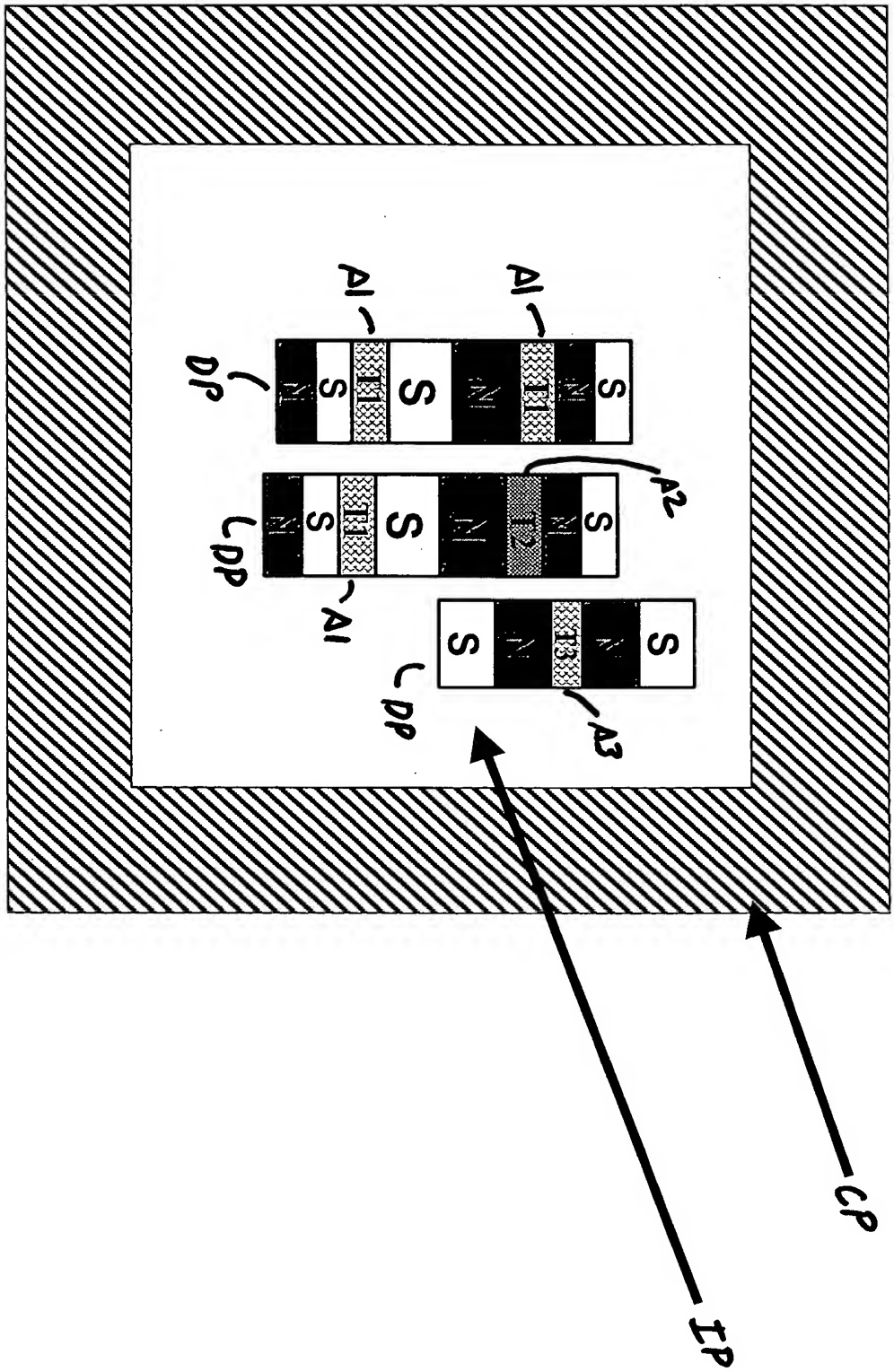


Figure 7F

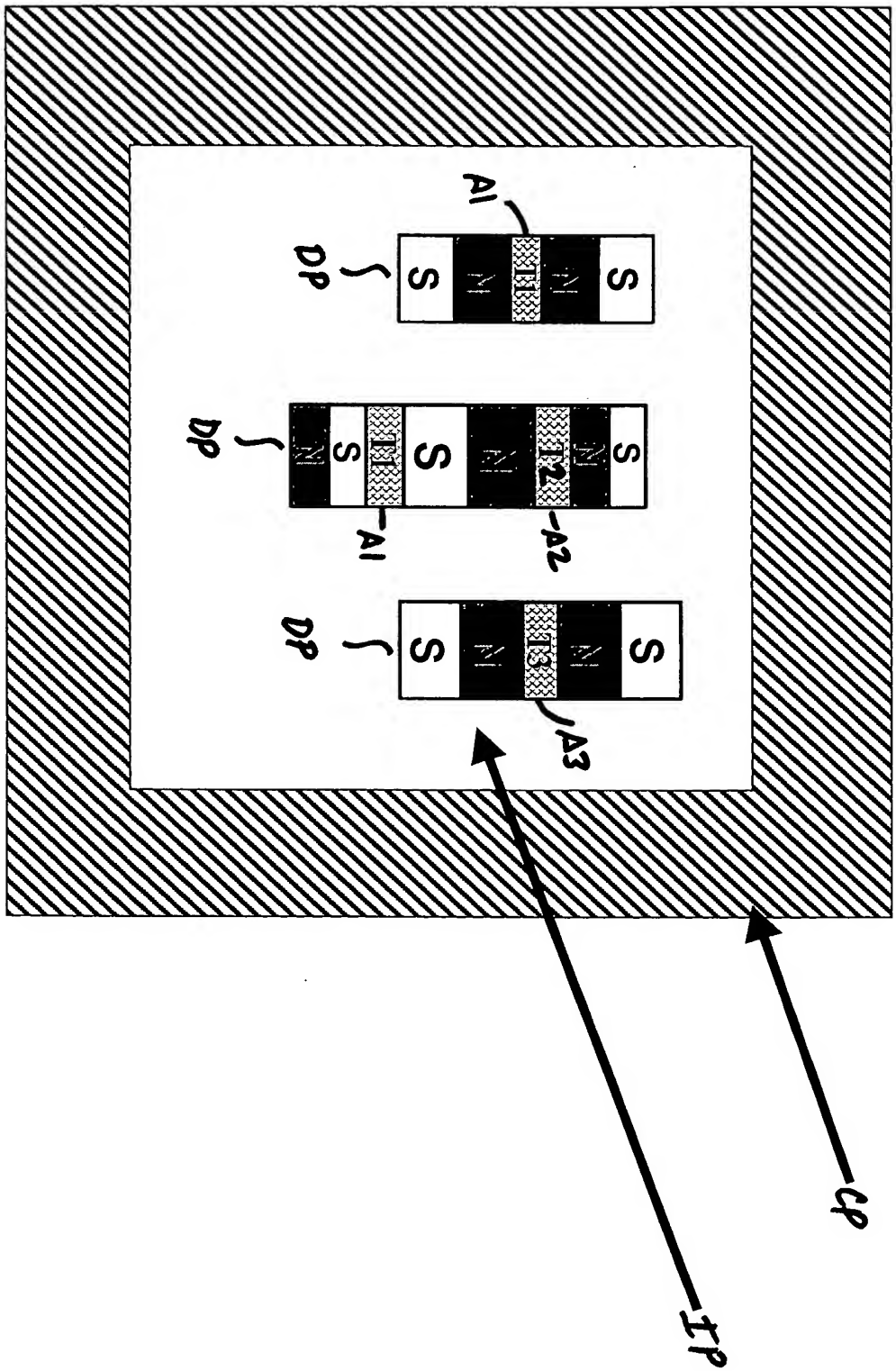


Figure 7G

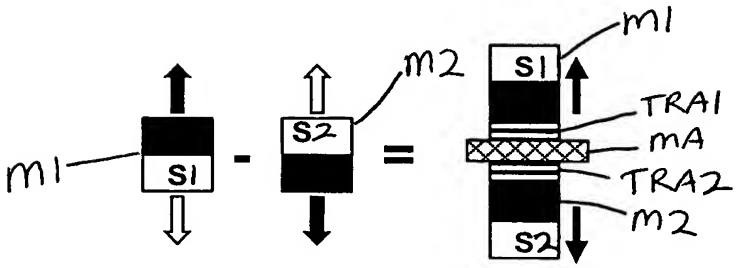


FIG. 8

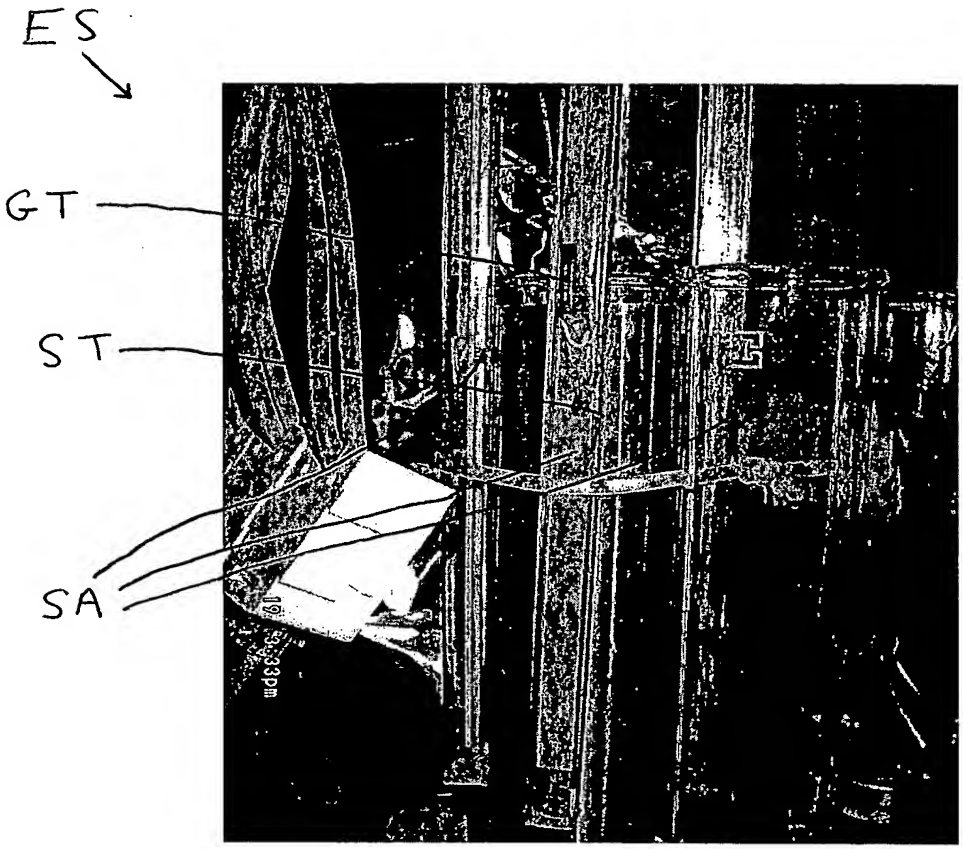


FIG. 9

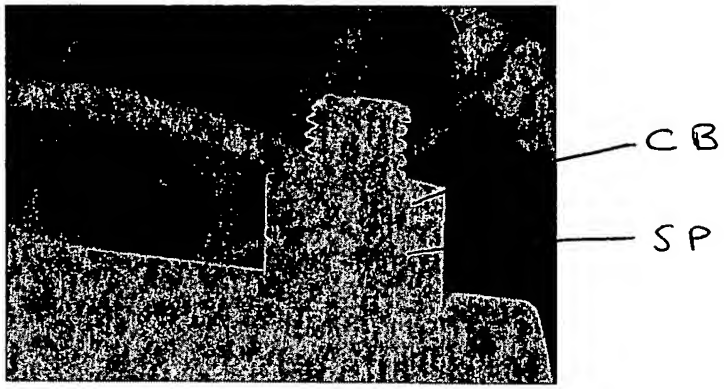


FIG. 10

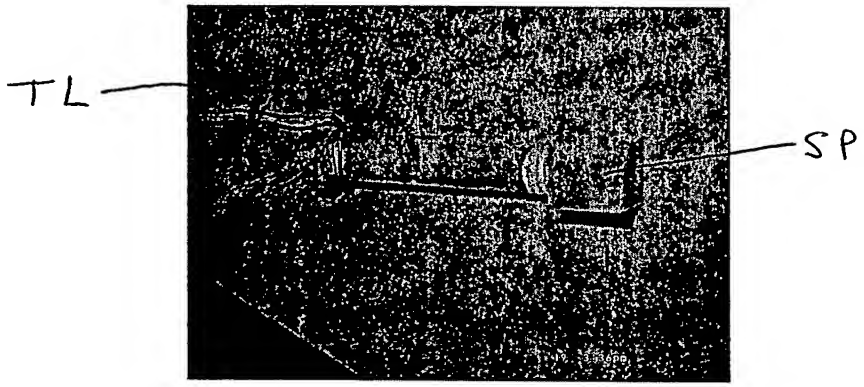


FIG. 11

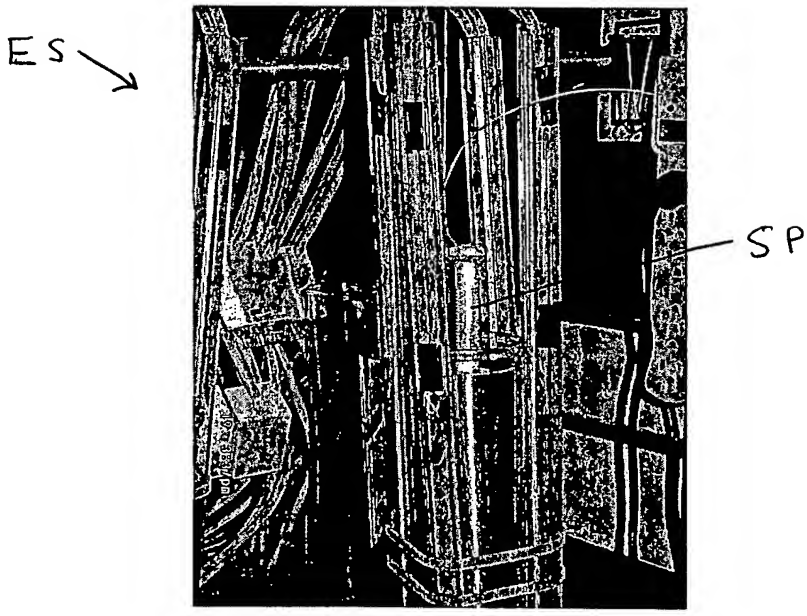


FIG. 12

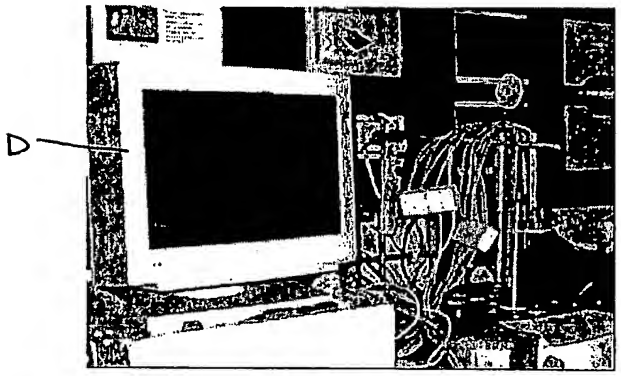


FIG. 13

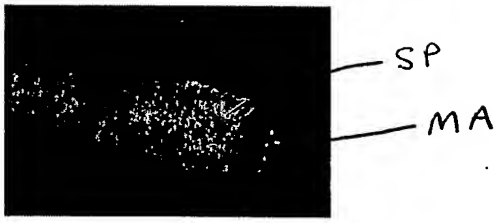


FIG. 14A

FIG. 14B

FIG. 14C

FIG. 14D

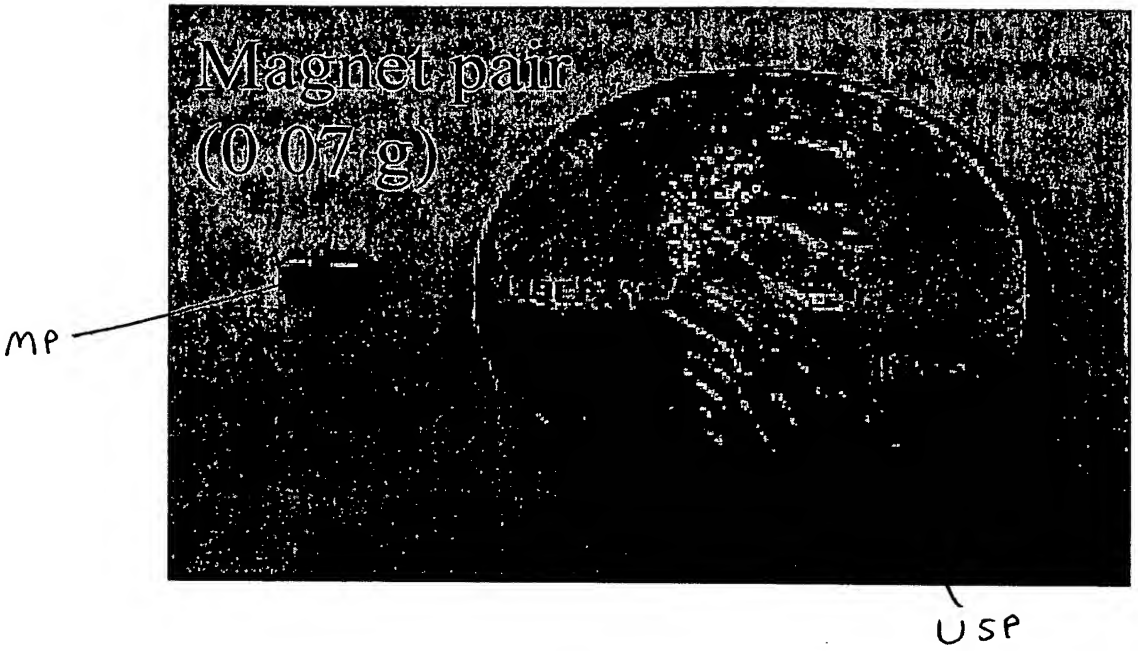


FIG. 15

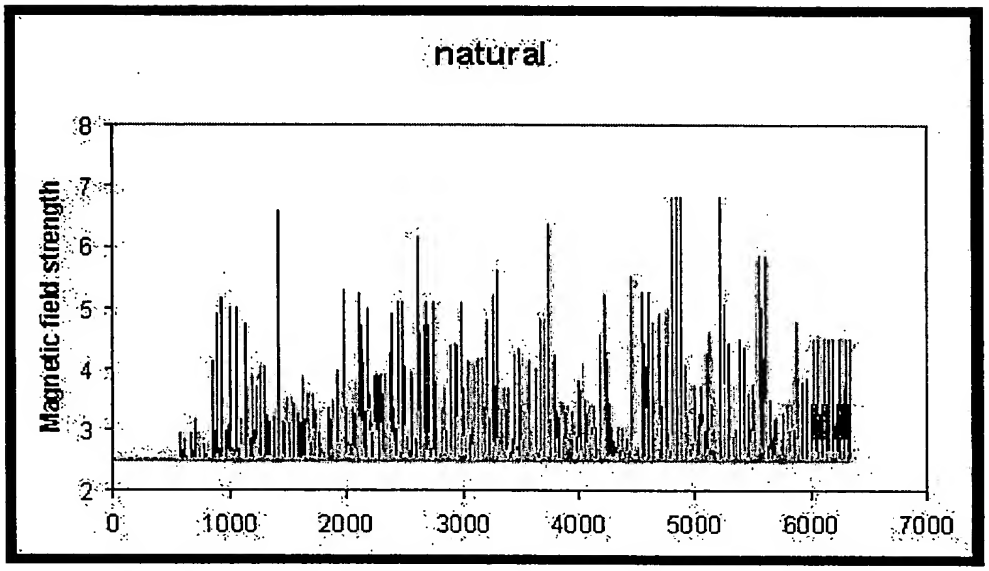

natural
Magnetic field strength
8
7
6
5
4
3
2
0
1000
2000
3000
4000
5000
6000
7000

FIG. 16

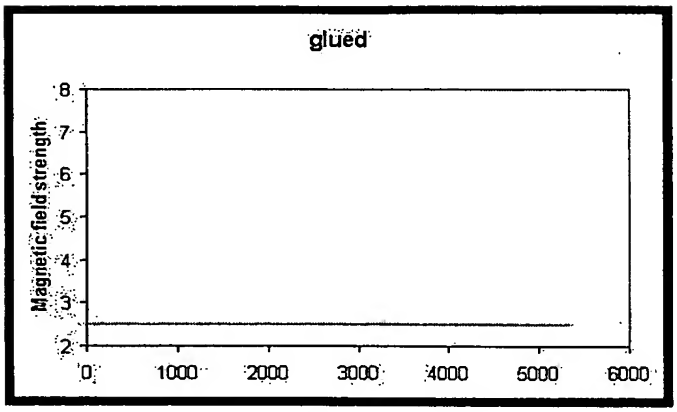


FIG. 17

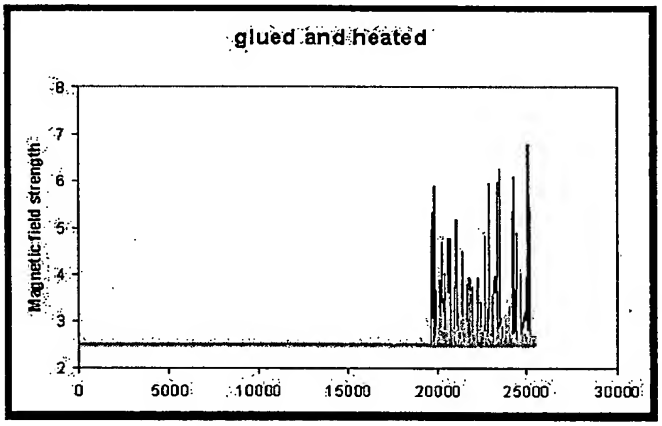


FIG. 18

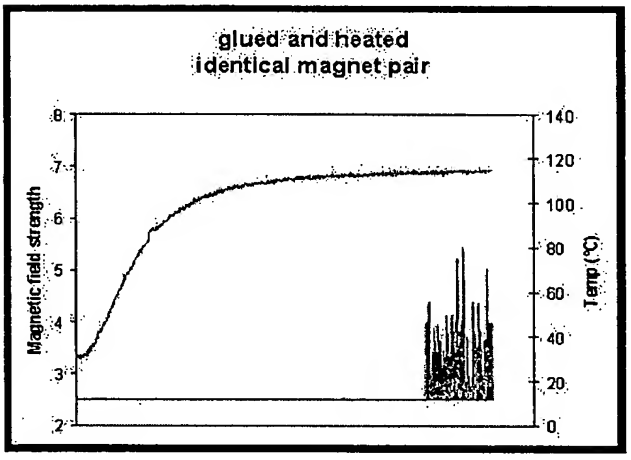


FIG. 19

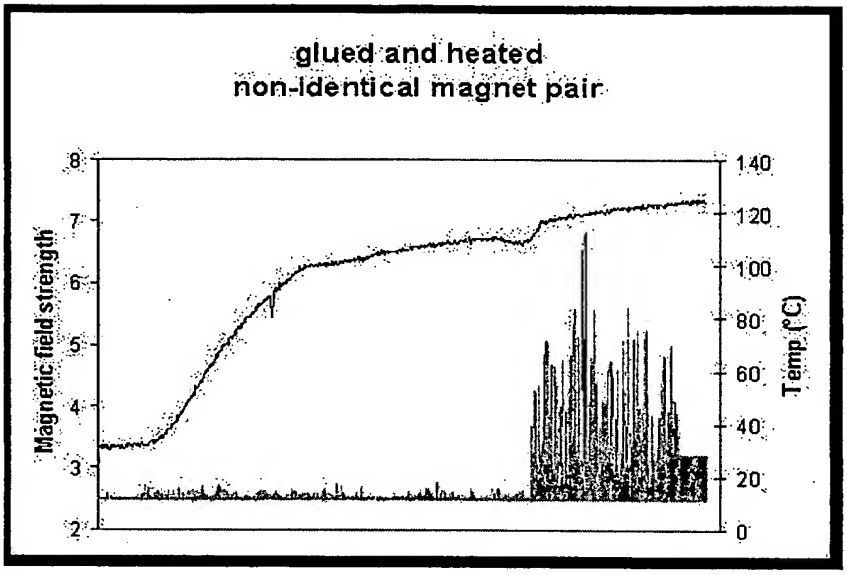

glued and heated
non-identical magnet pair
Magnetic field strength
Temp (°C)
8
7
6
5
4
3
2
140
120
100
80
60
40
20
0

FIG. 20

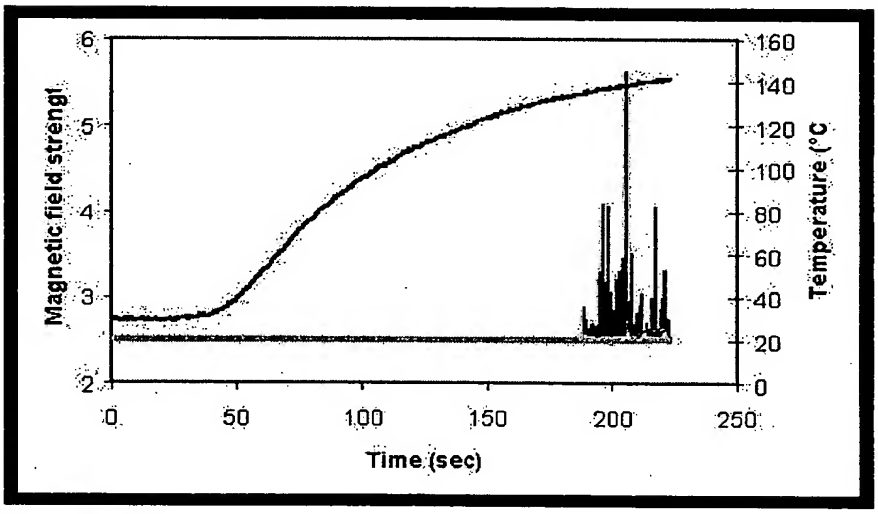

Magnetic field strengt
Temperature (°C
Time (sec)
6
5
4
3
2
160
140
120
100
80
60
40
20
0
0
50
100
150
200
250

FIG. 21

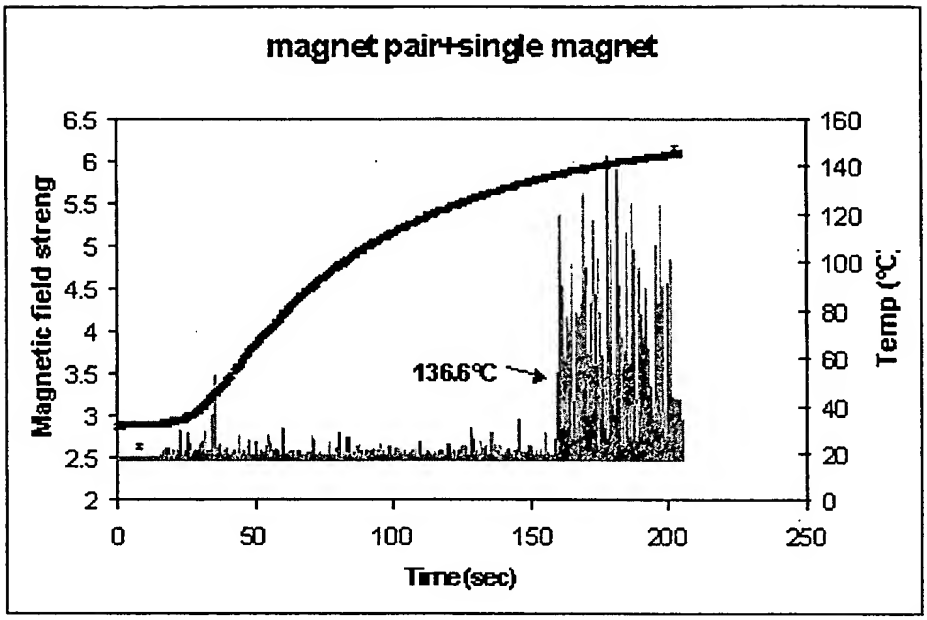

magnet pair+single magnet
Magnetic field streng
Temp (°C)
Time (sec)
136.6°C
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
160
140
120
100
80
60
40
20
0
0
50
100
150
200
250

FIG. 22

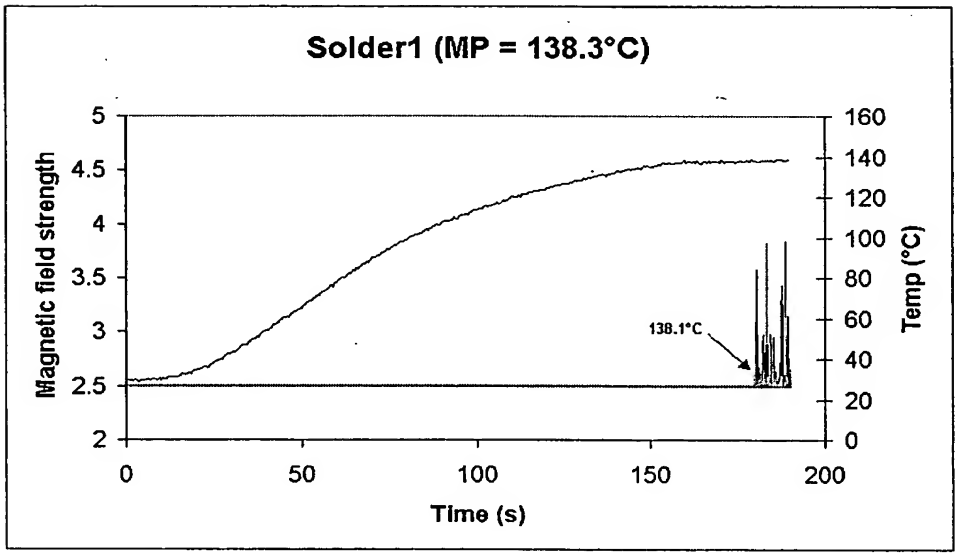

Solder1 (MP = 138.3°C)
Magnetic field strength
Temp (°C)
Time (s)
138.1°C
5
4.5
4
3.5
3
2.5
2
160
140
120
100
80
60
40
20
0
0
50
100
150
200

FIG. 23

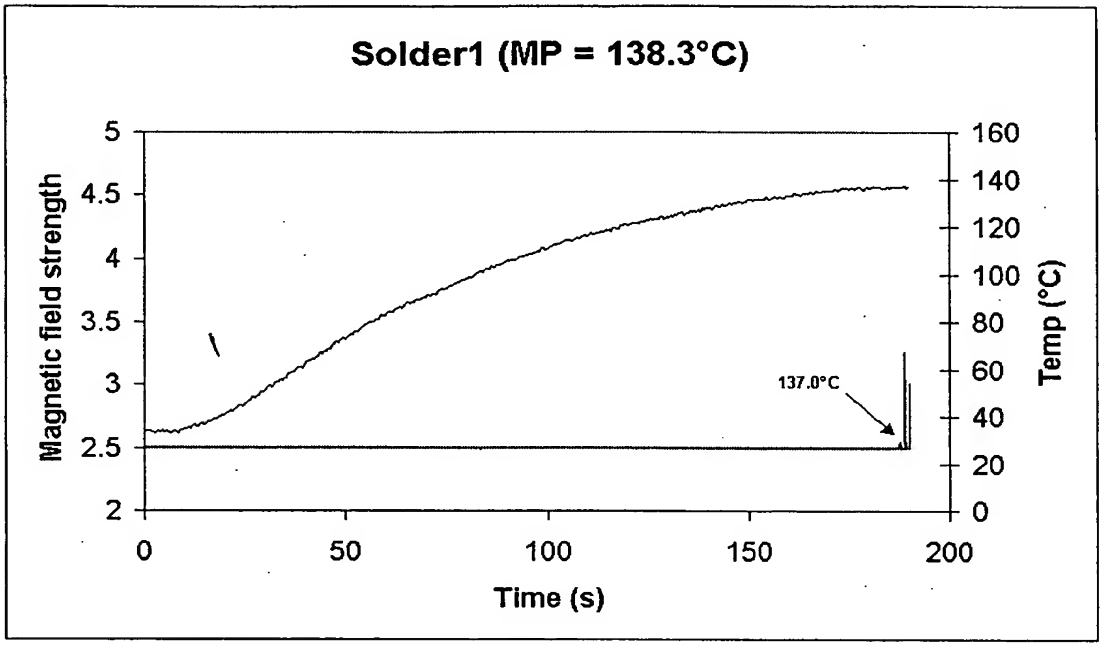

Solder1 (MP = 138.3°C)
Magnetic field strength
Temp (°C)
Time (s)
137.0°C
5
4.5
4
3.5
3
2.5
2
160
140
120
100
80
60
40
20
0
0
50
100
150
200

FIG. 24

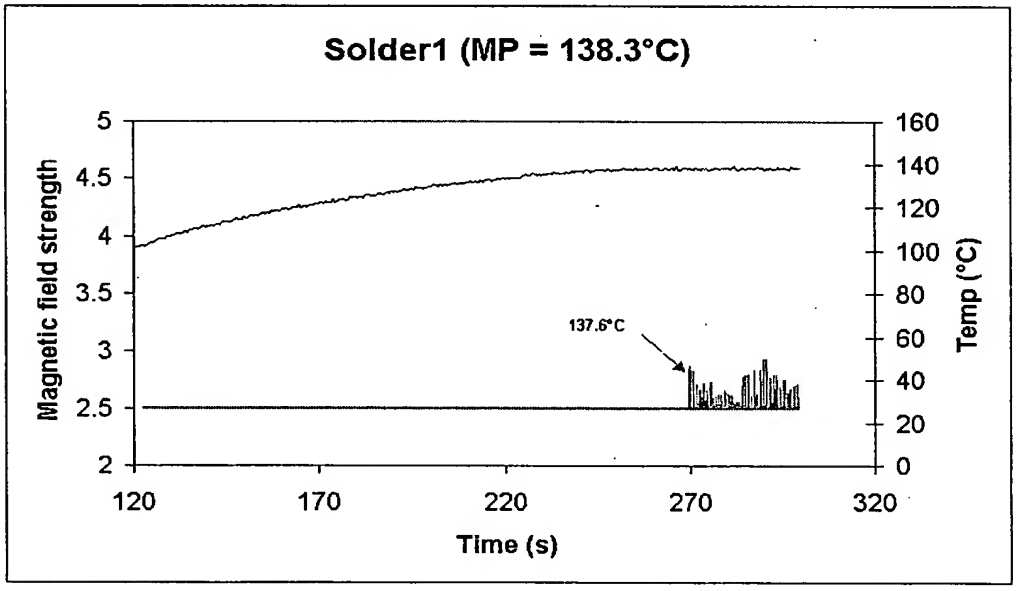

Solder1 (MP = 138.3°C)
Magnetic field strength
Temp (°C)
Time (s)
137.6°C
5
4.5
4
3.5
3
2.5
2
160
140
120
100
80
60
40
20
0
120
170
220
270
320

FIG. 25

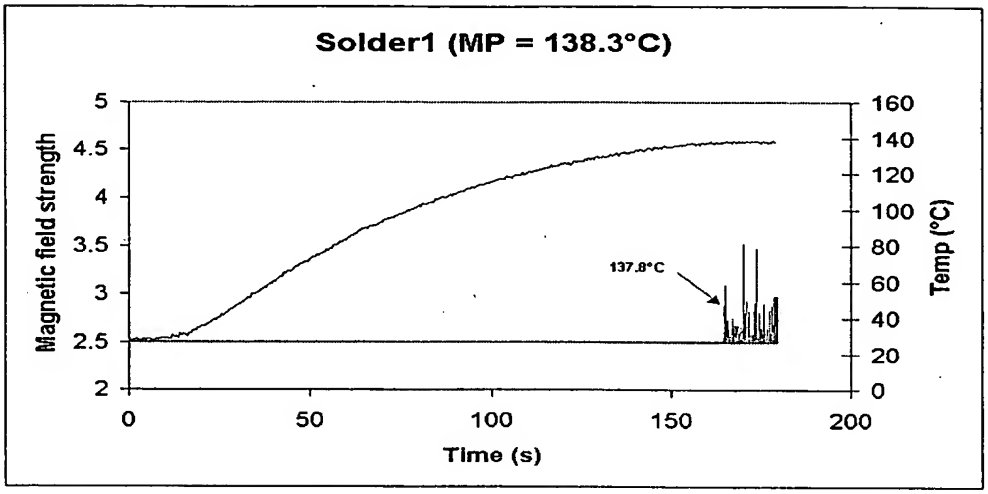

Solder1 (MP = 138.3°C)
Magnetic field strength
Temp (°C)
Time (s)
137.8°C
5
4.5
4
3.5
3
2.5
2
160
140
120
100
80
60
40
20
0
0
50
100
150
200

FIG. 26

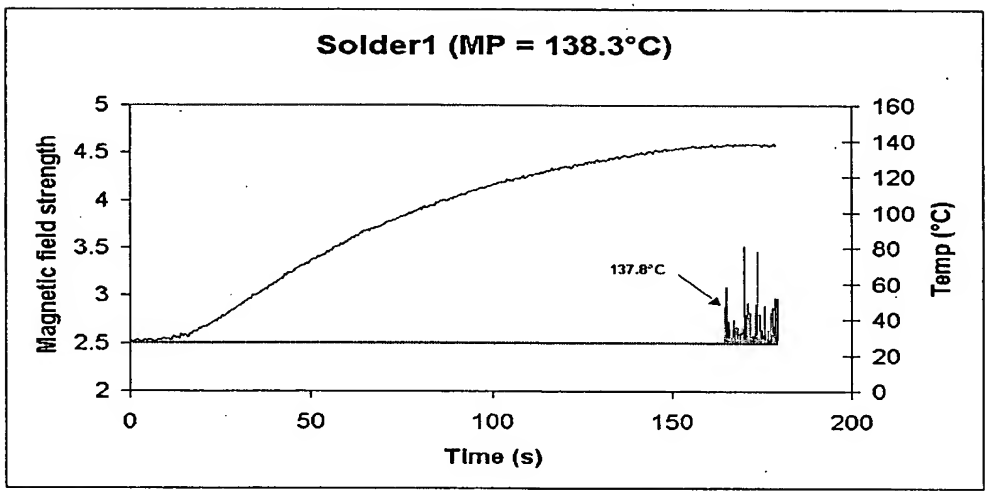

Solder1 (MP = 138.3°C)
Magnetic field strength
Temp (°C)
Time (s)
137.8°C
5
4.5
4
3.5
3
2.5
2
160
140
120
100
80
60
40
20
0
0
50
100
150
200

FIG. 27

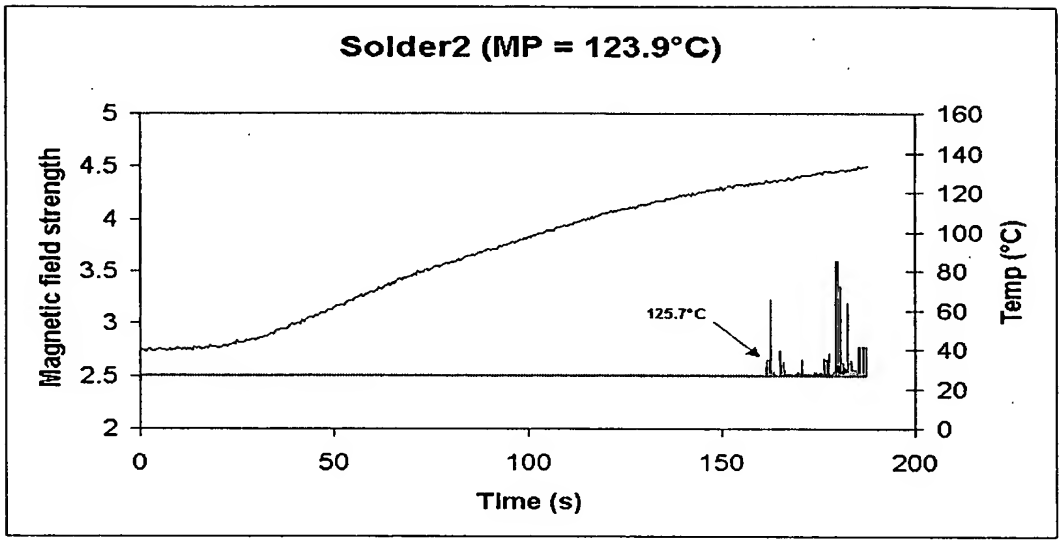

Solder2 (MP = 123.9°C)
Magnetic field strength
Temp (°C)
Time (s)
125.7°C
5
4.5
4
3.5
3
2.5
2
160
140
120
100
80
60
40
20
0
0
50
100
150
200

FIG. 28

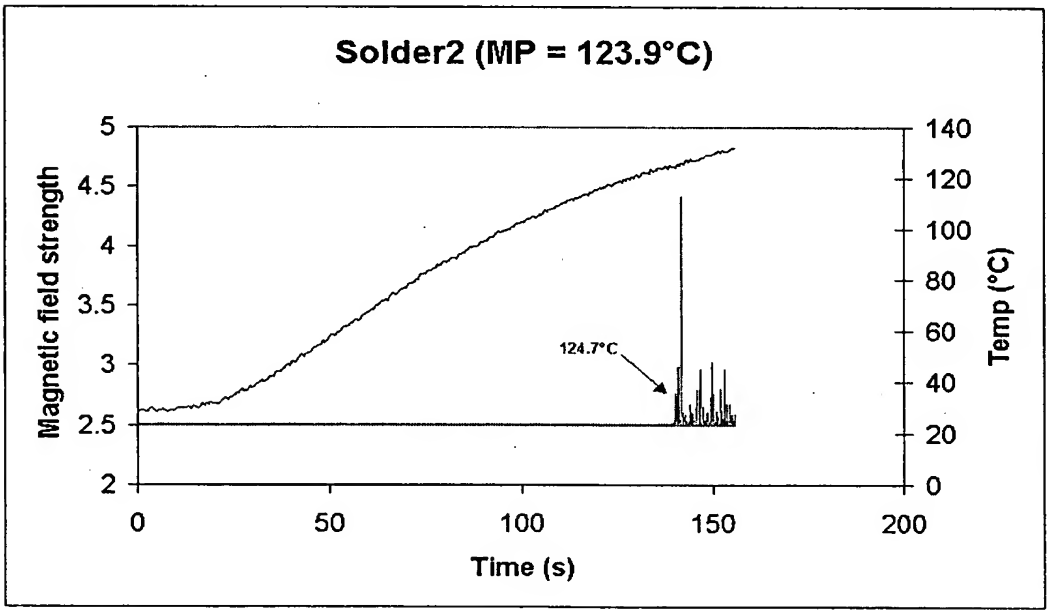

Solder2 (MP = 123.9°C)
Magnetic field strength
Temp (°C)
Time (s)
124.7°C
5
4.5
4
3.5
3
2.5
2
140
120
100
80
60
40
20
0
0
50
100
150
200

FIG. 29

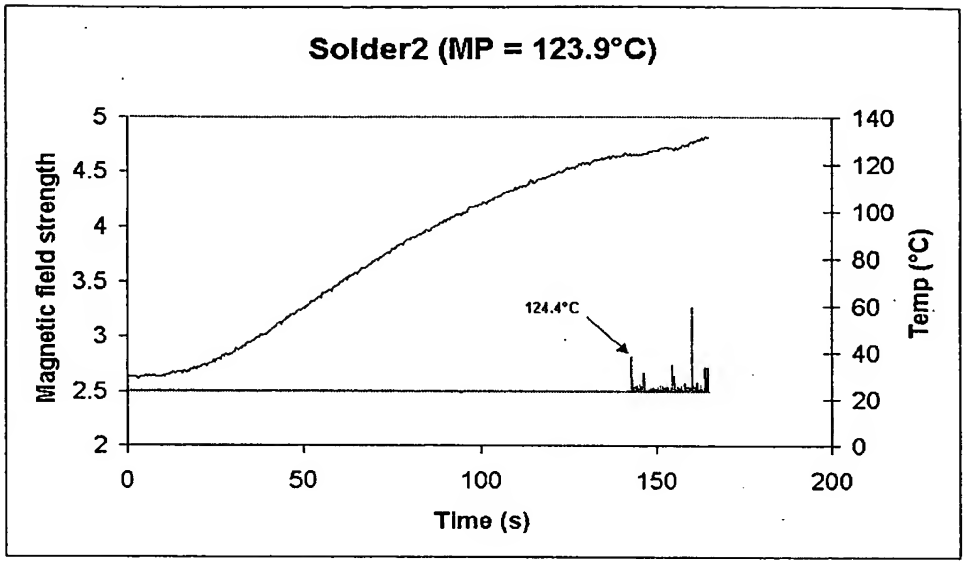

Solder2 (MP = 123.9°C)
Magnetic field strength
5
4.5
4
3.5
3
2.5
2
124.4°C
140
120
100
80
60
40
20
0
Temp (°C)
0
50
100
150
200
Time (s)

FIG. 30

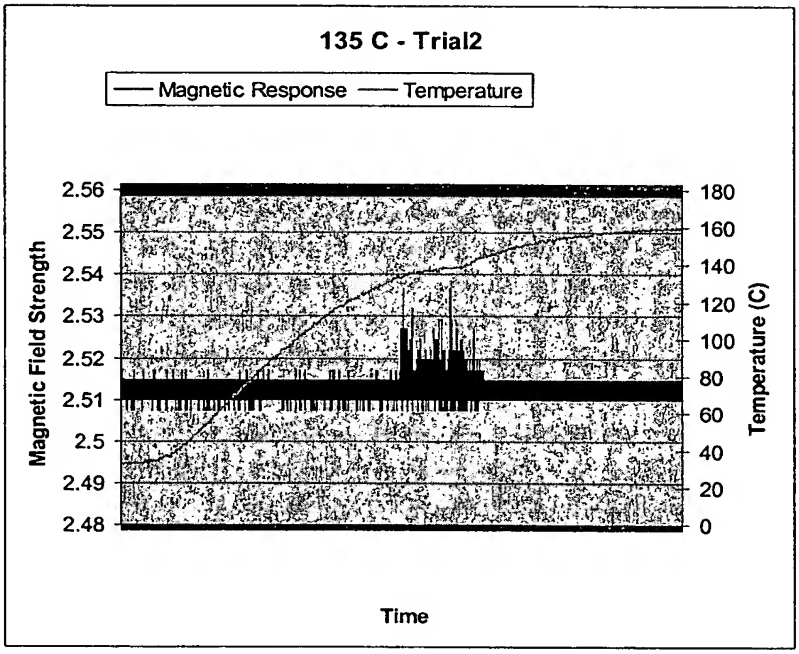

135 C - Trial2
Magnetic Response
Temperature
Magnetic Field Strength
2.56
2.55
2.54
2.53
2.52
2.51
2.5
2.49
2.48
180
160
140
120
100
80
60
40
20
0
Temperature (C)
Time

FIG. 31

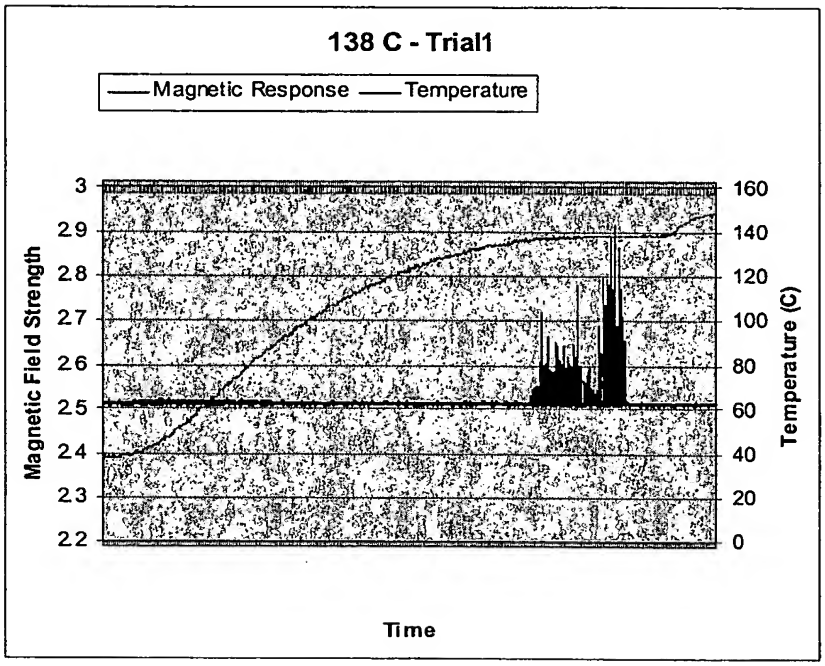

138 C - Trial1
Magnetic Response
Temperature
Magnetic Field Strength
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
160
140
120
100
80
60
40
20
0
Temperature (C)
Time

FIG. 32

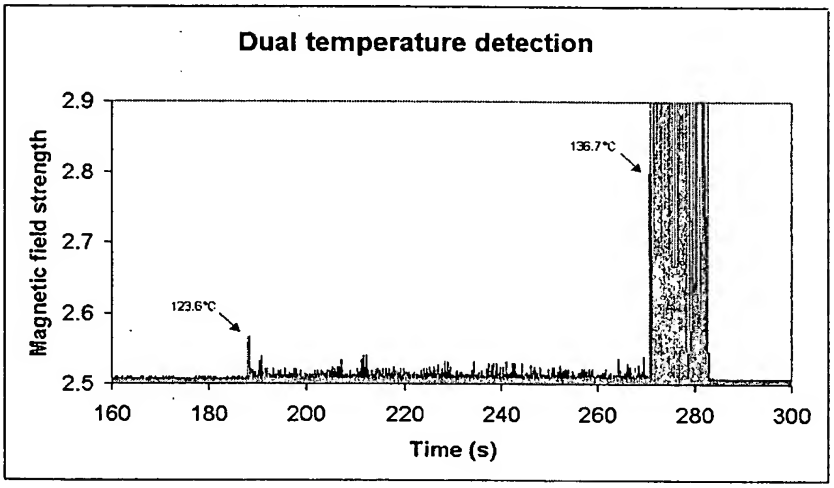

Dual temperature detection
Magnetic field strength
2.9
2.8
2.7
2.6
2.5
123.6°C
136.7°C
160
180
200
220
240
260
280
300
Time (s)

FIG. 33

Title: Methods, Systems, and Devices
for Evaluation of Thermal Treatment
Inventors: Palazoglu et al.
Attorney Docket No. 297/164/2

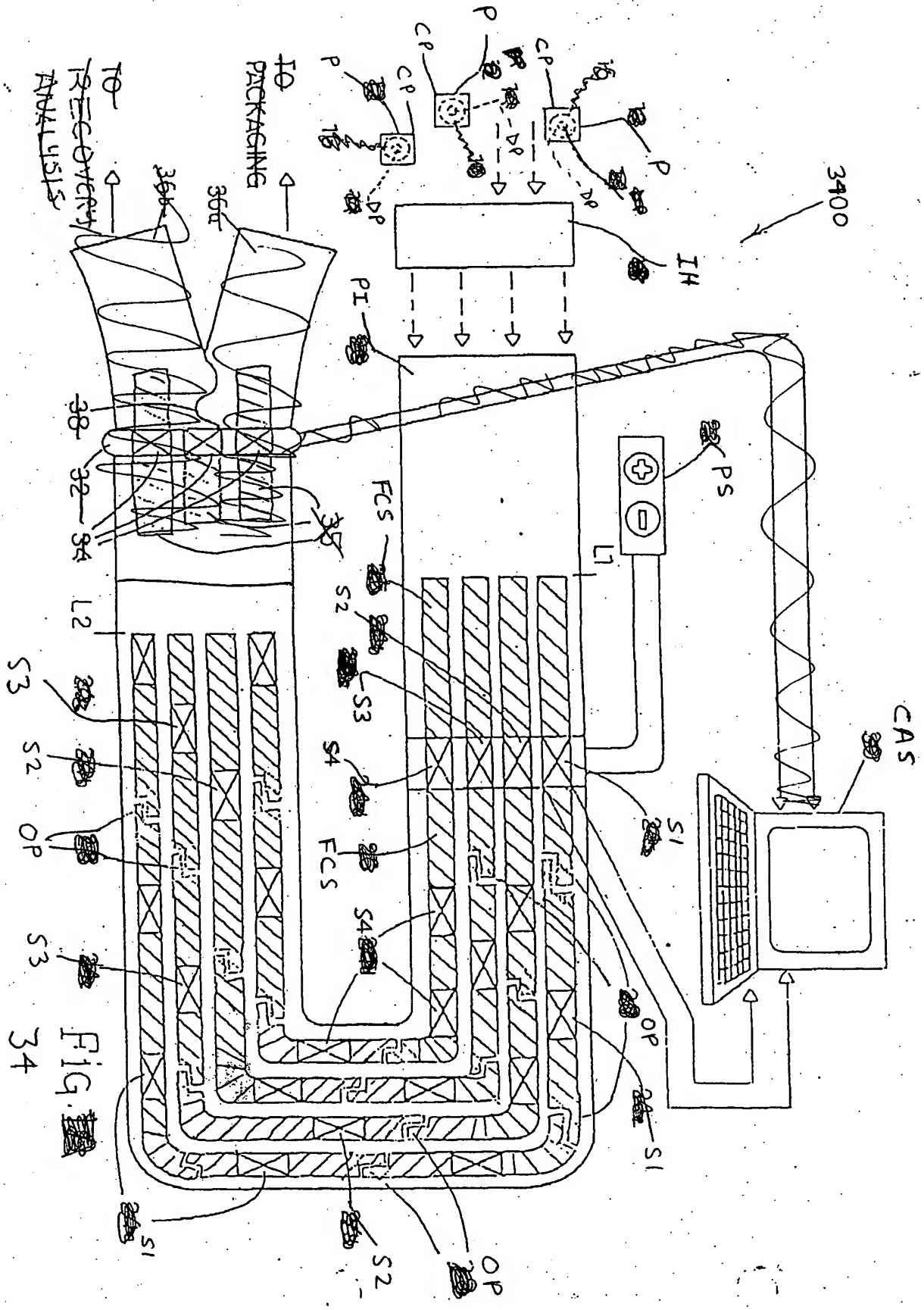


FIG. 34

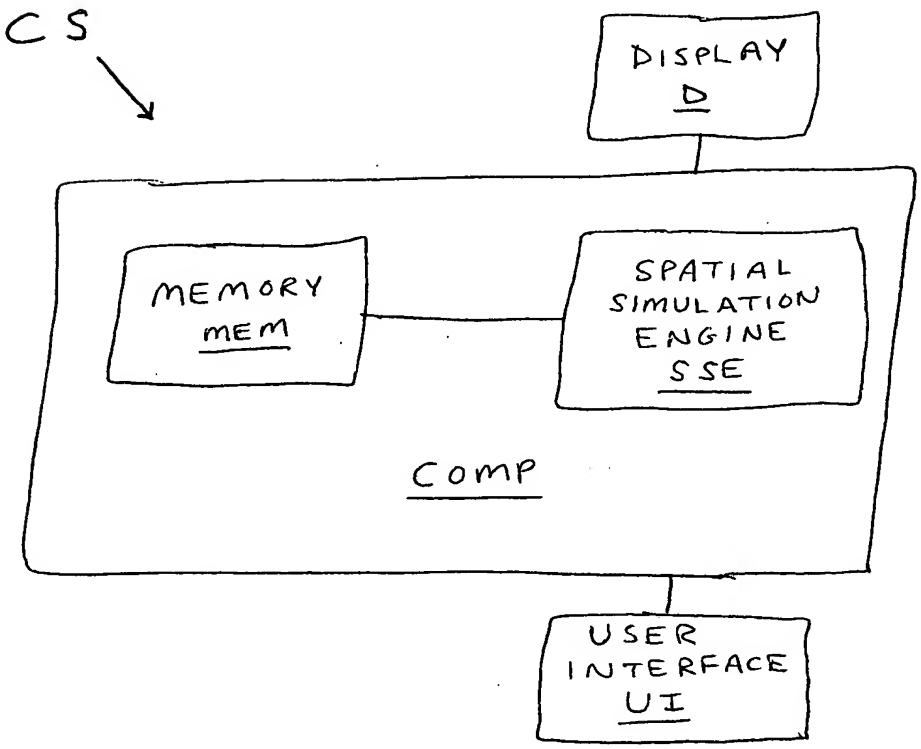

CS
DISPLAY
D
MEMORY
MEM
SPATIAL
SIMULATION
ENGINE
SSE
COMP
USER
INTERFACE
UI

FIG. 35

FIG. 36

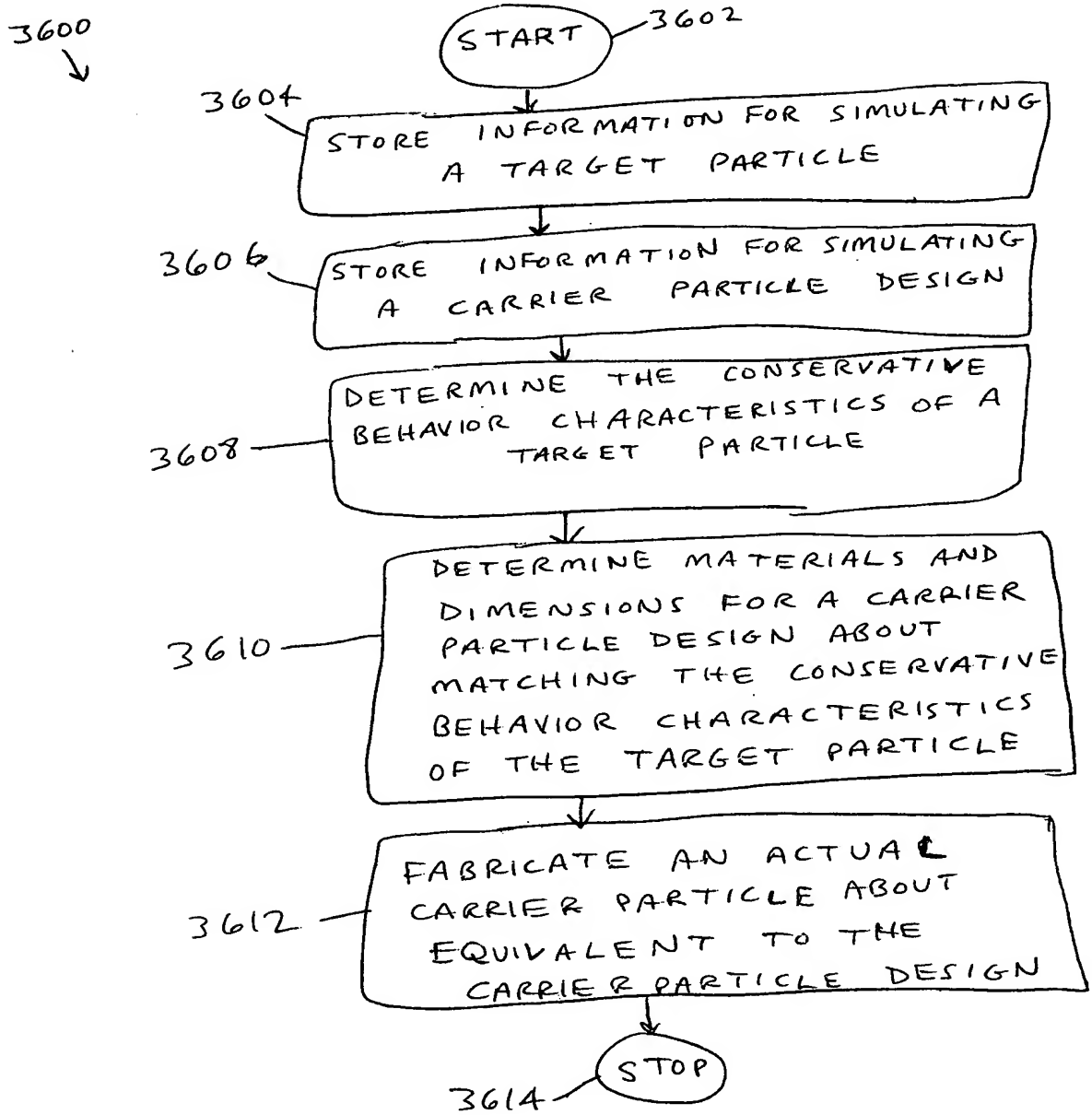

3600
START
3602
3604
STORE INFORMATION FOR SIMULATING A TARGET PARTICLE
3606
STORE INFORMATION FOR SIMULATING A CARRIER PARTICLE DESIGN
3608
DETERMINE THE CONSERVATIVE BEHAVIOR CHARACTERISTICS OF A TARGET PARTICLE
3610
DETERMINE MATERIALS AND DIMENSIONS FOR A CARRIER PARTICLE DESIGN ABOUT MATCHING THE CONSERVATIVE BEHAVIOR CHARACTERISTICS OF THE TARGET PARTICLE
3612
FABRICATE AN ACTUAL CARRIER PARTICLE ABOUT EQUIVALENT TO THE CARRIER PARTICLE DESIGN
STOP
3614

FIG. 37

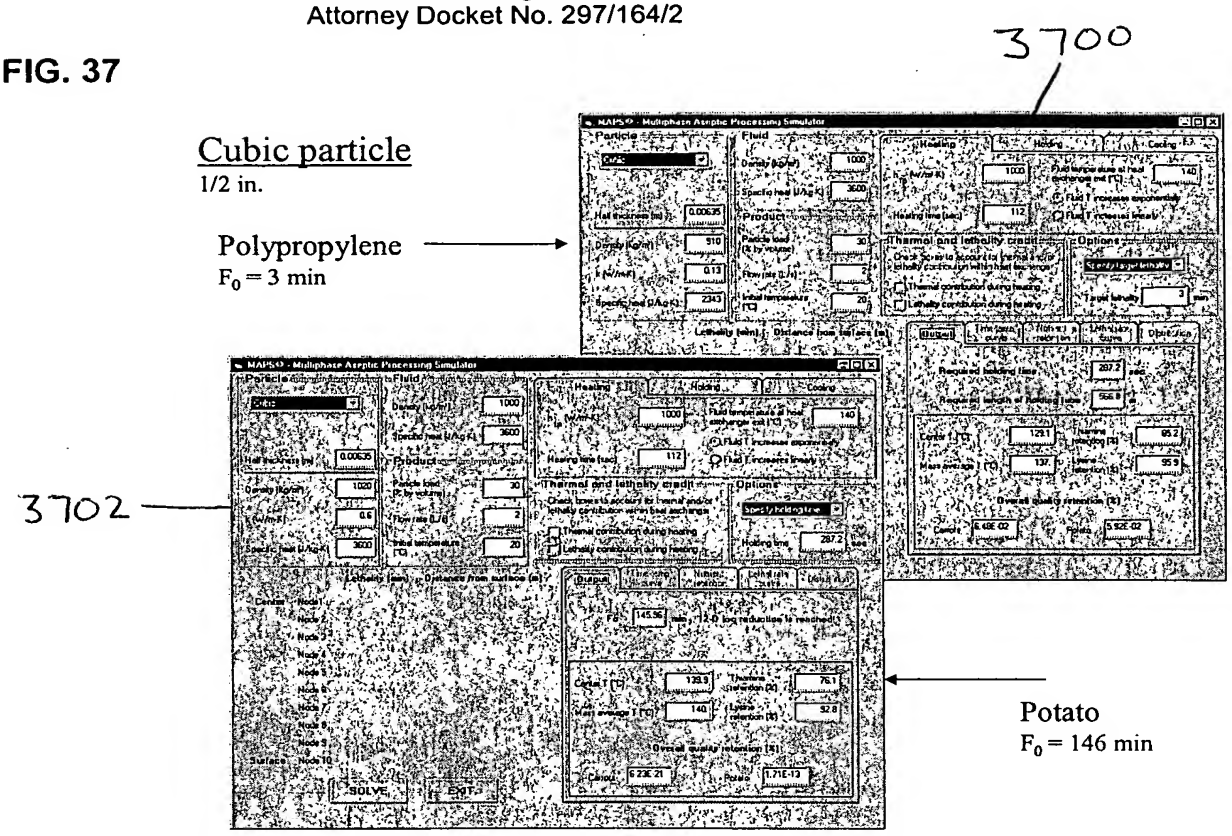

3700
Cubic particle
1/2 in.
Polypropylene
F_0 = 3 min
3702
Potato
F_0 = 146 min

FIG. 38

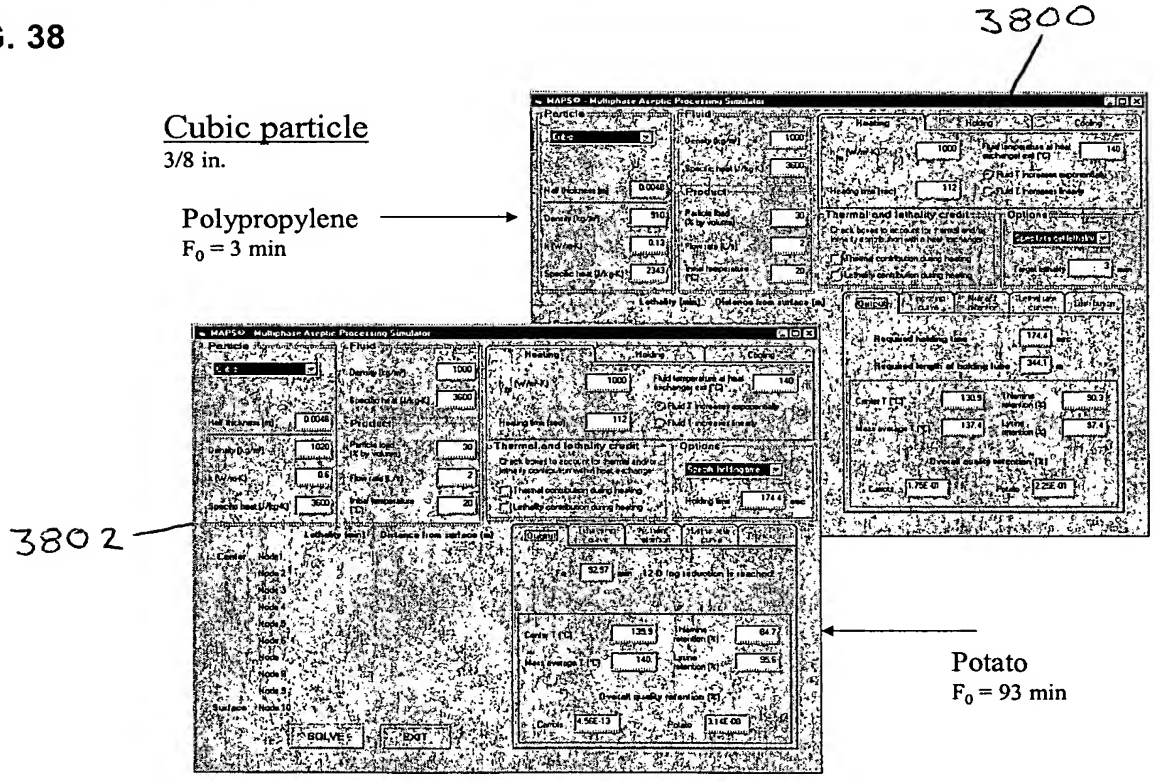

3800
Cubic particle
3/8 in.
Polypropylene
F_0 = 3 min
3802
Potato
F_0 = 93 min

FIG. 39

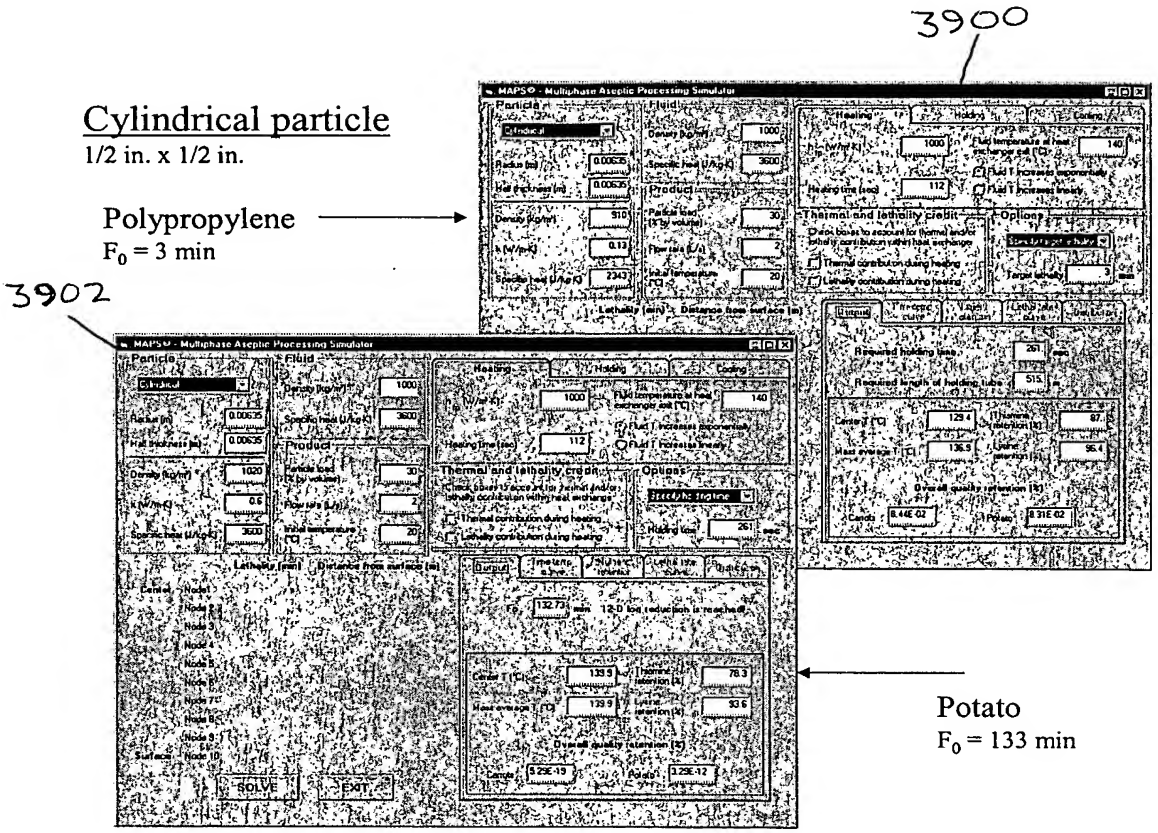
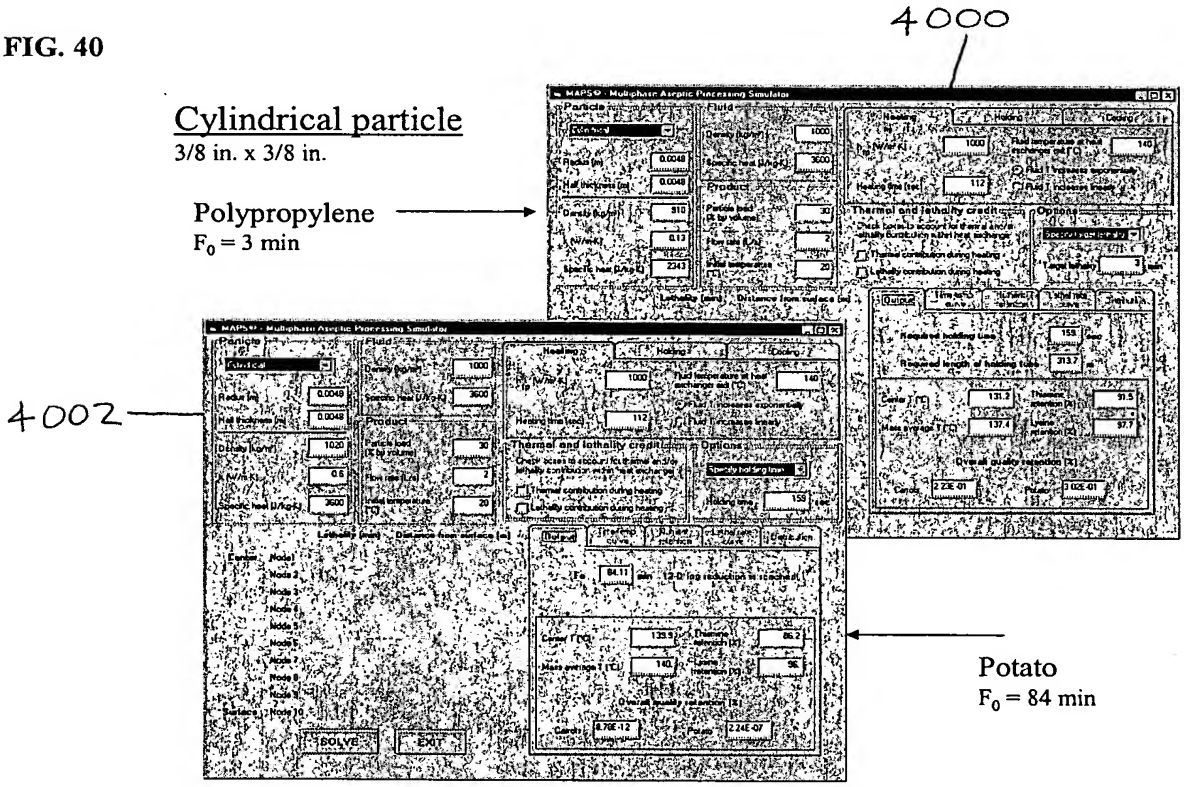

3900
Cylindrical particle
1/2 in. x 1/2 in.
Polypropylene
F_0 = 3 min
3902
Potato
F_0 = 133 min

FIG. 40


4000
Cylindrical particle
3/8 in. x 3/8 in.
Polypropylene
F_0 = 3 min
4002
Potato
F_0 = 84 min

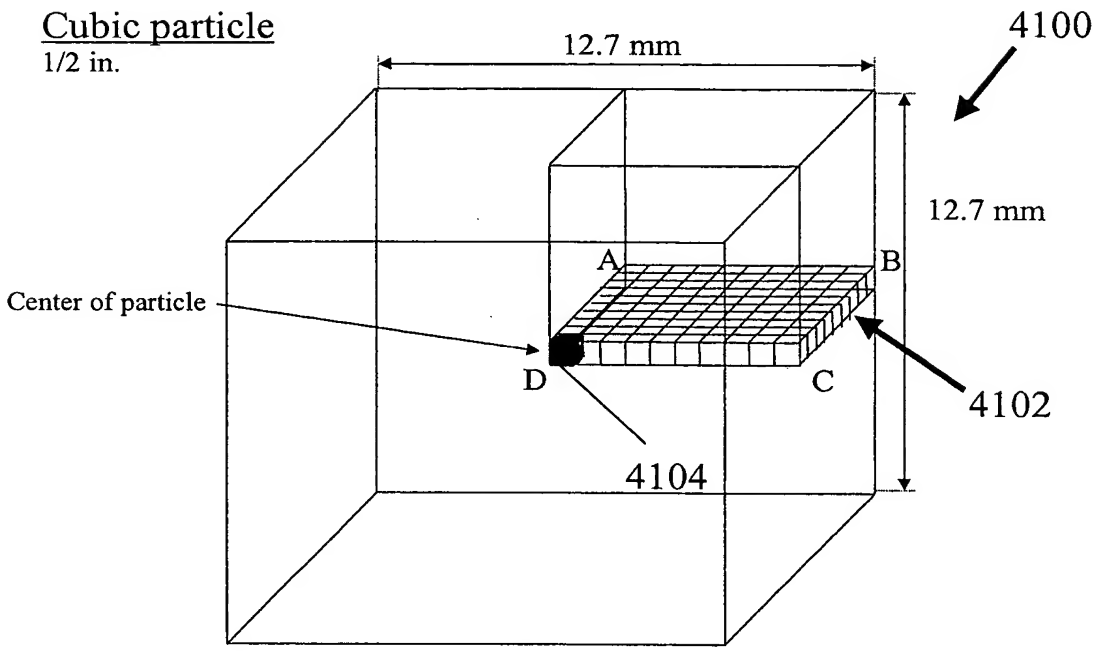

Cubic particle
1/2 in.
12.7 mm
4100
12.7 mm
A
B
Center of particle
D
C
4102
4104

FIG. 41

Potato
1/2 in.
F_0 (center) = 3 min.
Time = 131.4 s
(Holding only)
$\alpha = 1.63 \times 10^{-7}$ m²/s

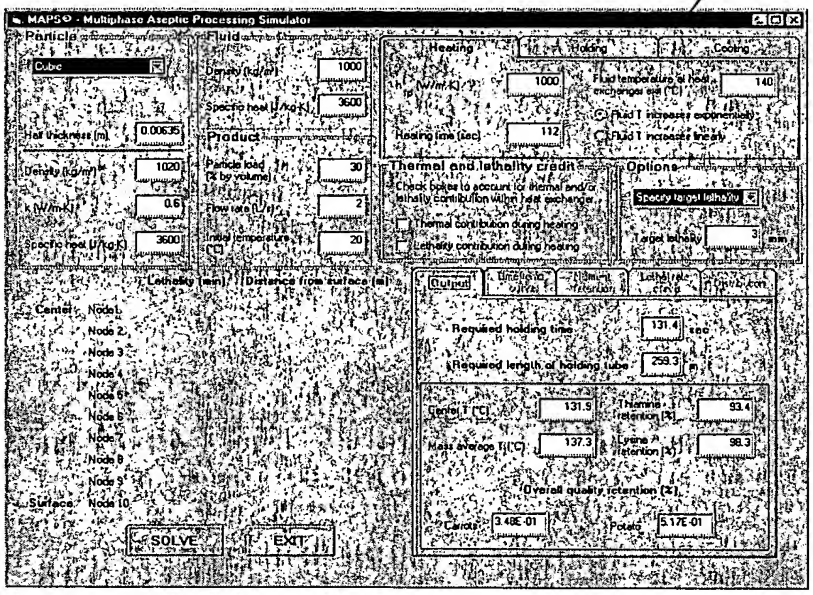


FIG. 42

Potato
1/2 in.

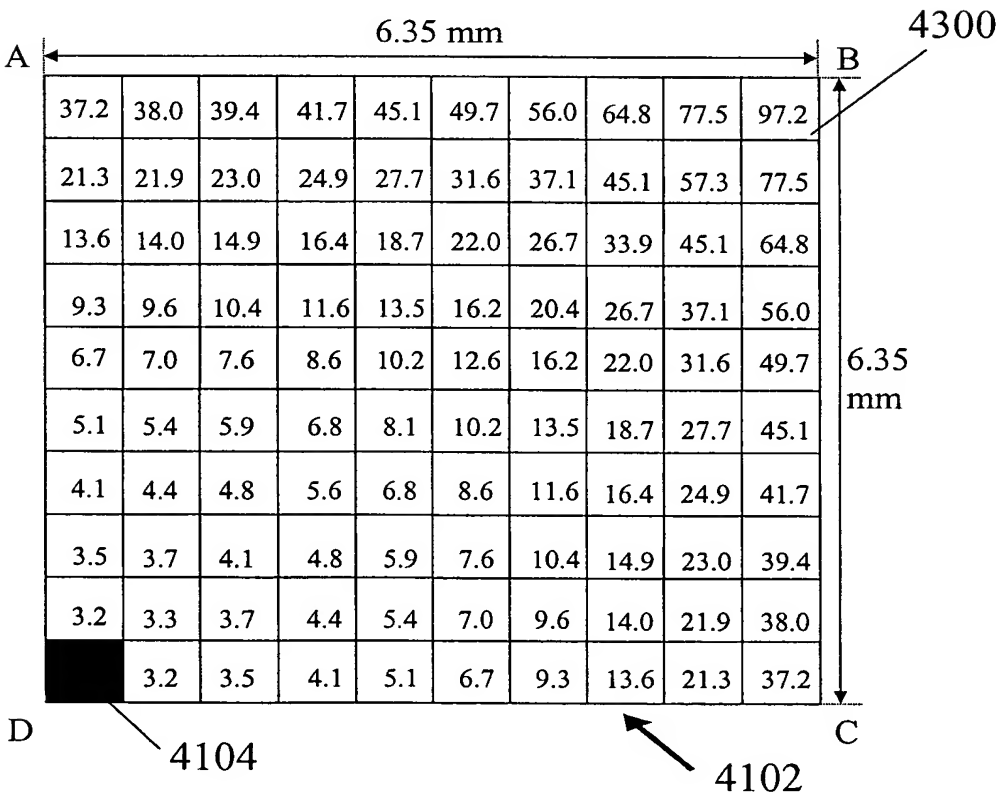


FIG. 43

TPX
1/2 in.
Time = 131.4 s
(Holding only)
$\alpha = 1.04 \times 10^{-7}\ m^2/s$

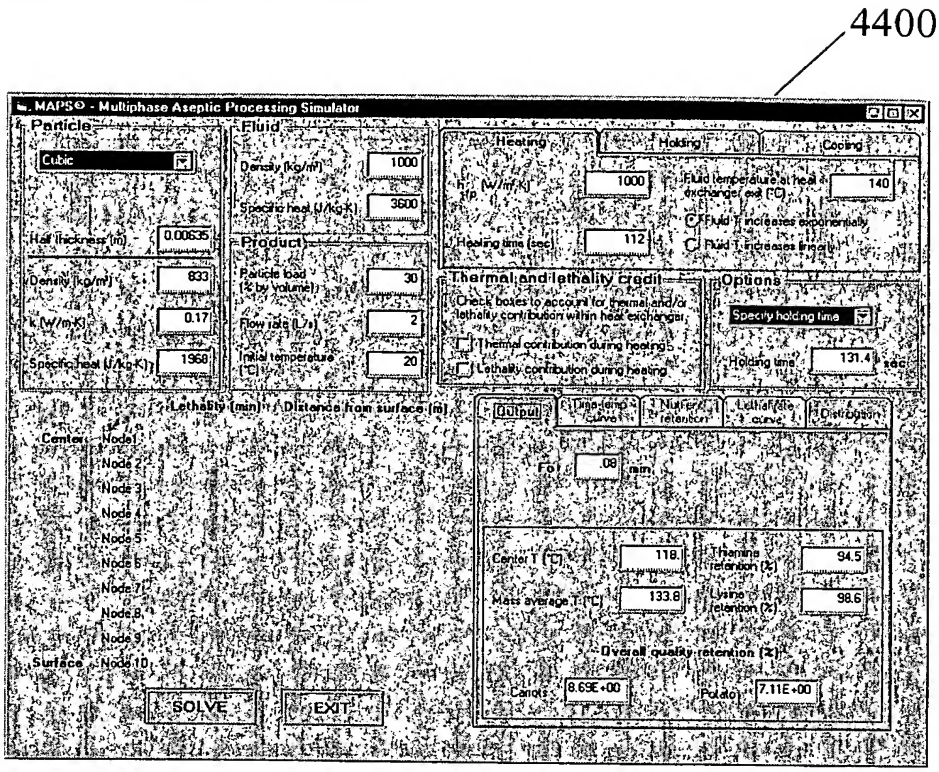


FIG. 44

TPX
1/2 in.

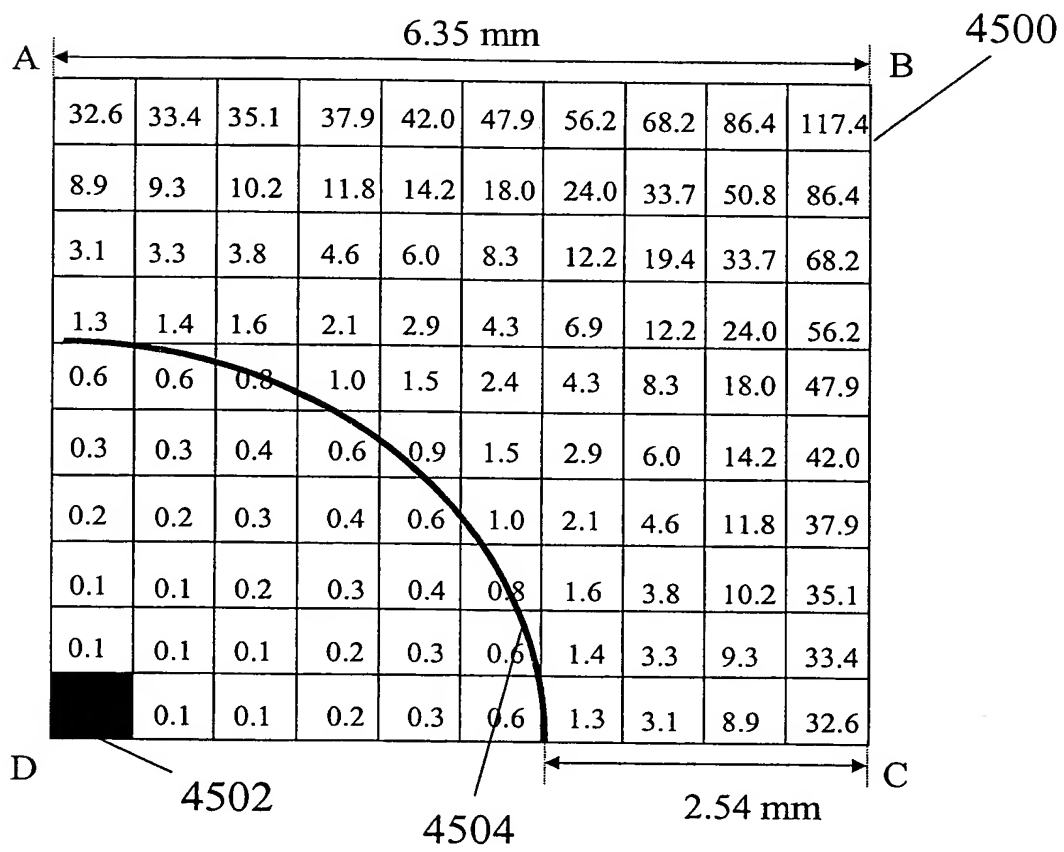


FIG. 45

Nylon
1/2 in.
Time = 131.4 s
(Holding only)
$\alpha = 1.40 \times 10^{-7}$ m²/s

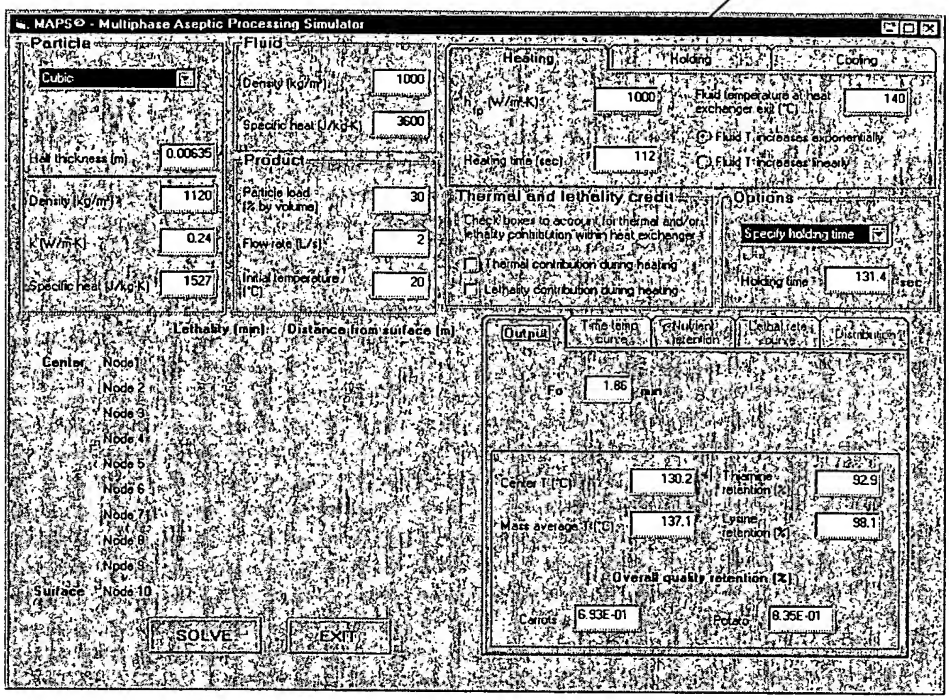


FIG. 46

Nylon
1/2 in.

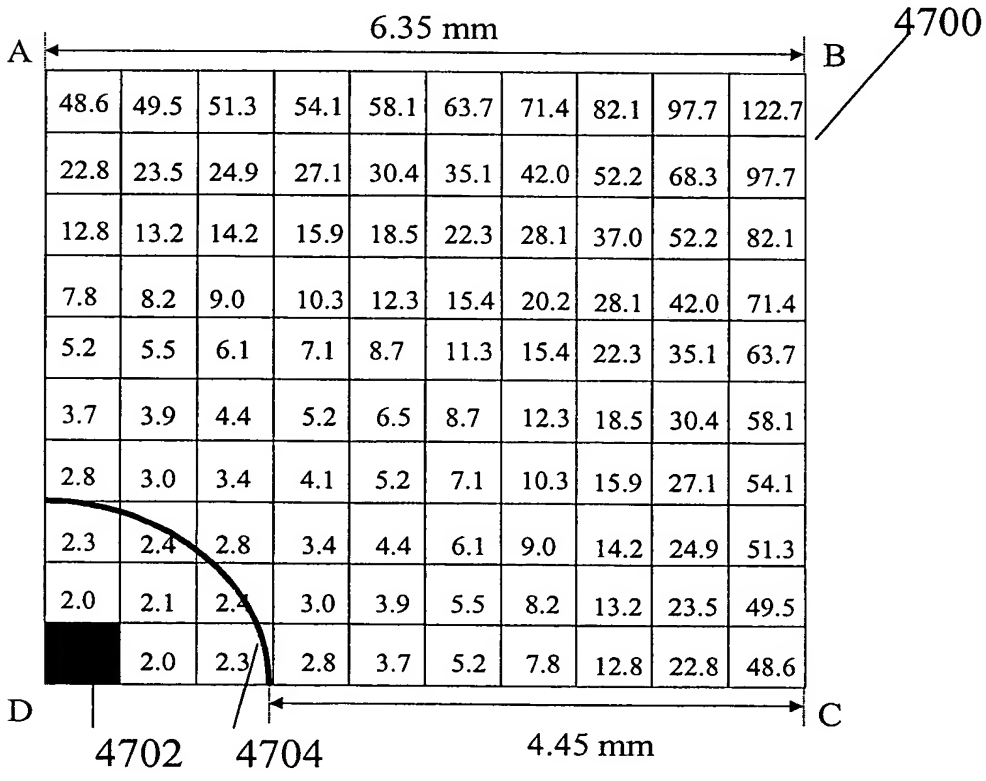


FIG. 47

Teflon
1/2 in.
Time = 131.4 s
(Holding only)
$\alpha = 1.15 \times 10^{-7}$ m²/s

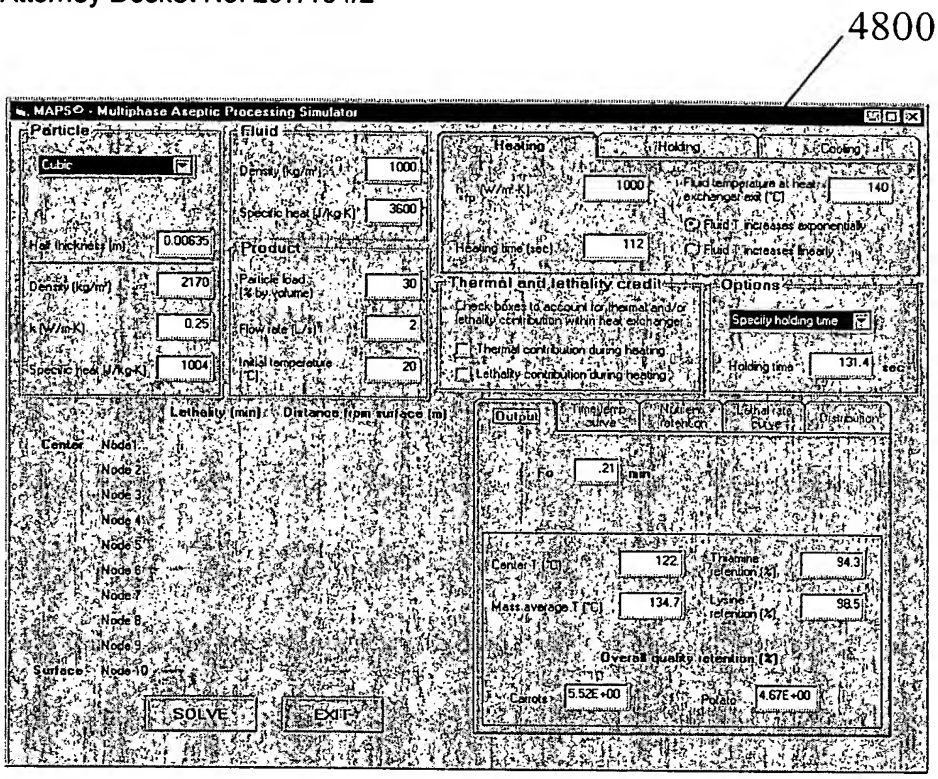


FIG. 48

Teflon
1/2 in.

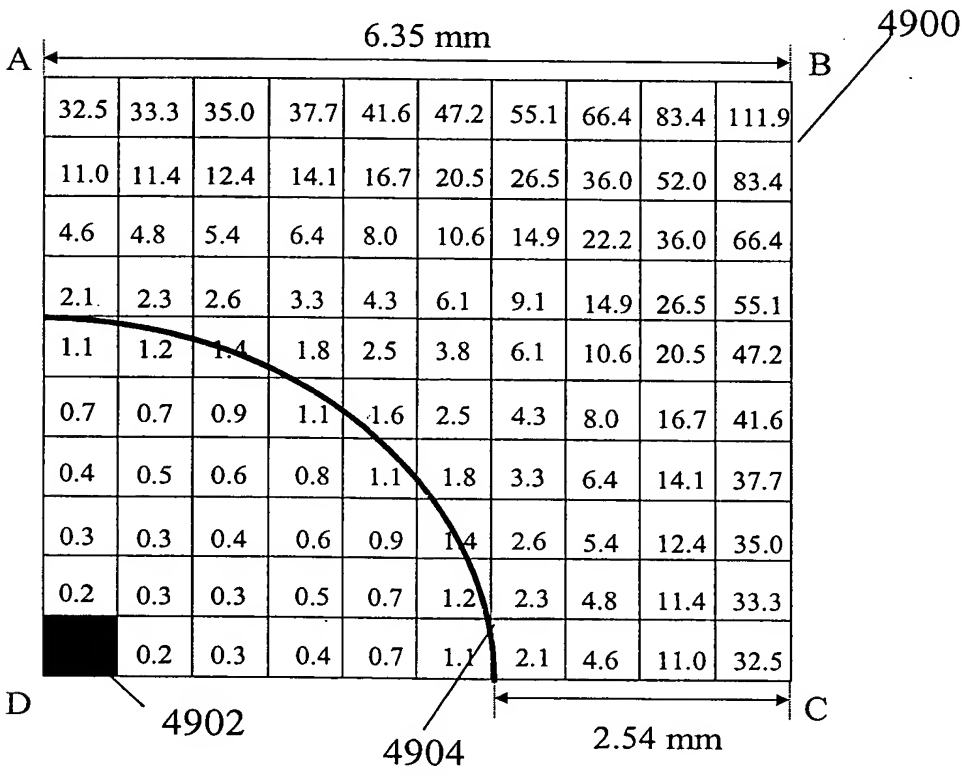


FIG. 49

Polypropylene
1/2 in.
Time = 131.4 s
(Holding only)
$\alpha = 6.10 \times 10^{-8}$ m²/s

5000

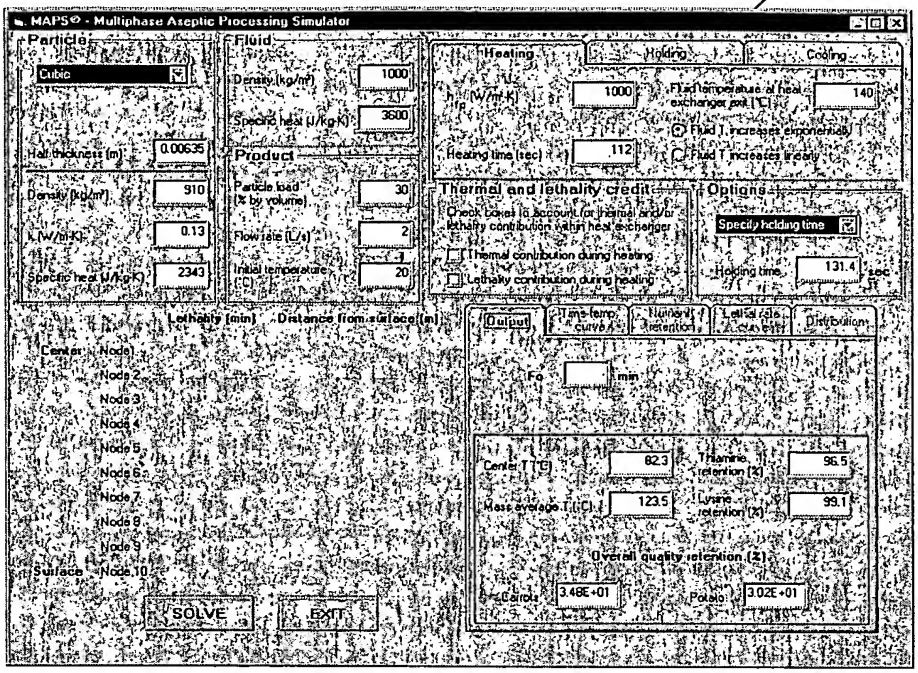


FIG. 50

Polypropylene
1/2 in.

5100

6.35 mm

A B C D

11.7	12.2	13.2	14.9	17.7	22.0	28.8	40.0	59.6	98.5
0.8	0.8	1.0	1.3	1.9	3.1	5.4	10.4	22.7	59.6
0.1	0.1	0.1	0.2	0.3	0.6	1.3	3.4	10.4	40.0
0.	0.	0.	0.	0.1	0.1	0.4	1.3	5.4	28.8
0.	0.	0.	0.	0.	0.	0.1	0.6	3.1	22.0
0.	0.	0.	0.	0.	0.	0.1	0.3	1.9	17.7
0.	0.	0.	0.	0.	0.	0.	0.2	1.3	14.9
0.	0.	0.	0.	0.	0.	0.	0.1	1.0	13.2
0.	0.	0.	0.	0.	0.	0.	0.1	0.8	12.2
	0.	0.	0.	0.	0.	0.	0.1	0.8	11.7

5102

5104

1.27 mm

FIG. 51

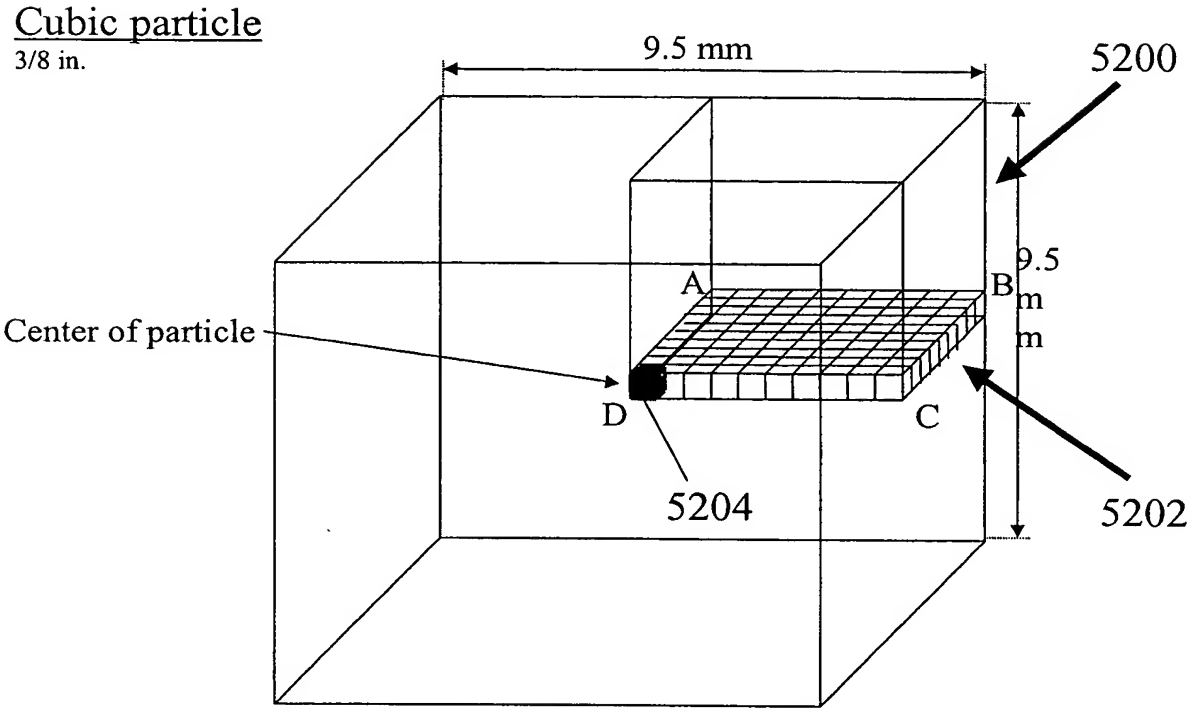

Cubic particle
3/8 in.
9.5 mm
5200
9.5 mm
A
B
Center of particle
D
C
5204
5202

FIG. 52

Potato
3/8 in.
F_0 (center) = 3 min.
Time = 82.1 s
(Holding only)
$\alpha = 1.63 \times 10^{-7}$ m²/s

5300

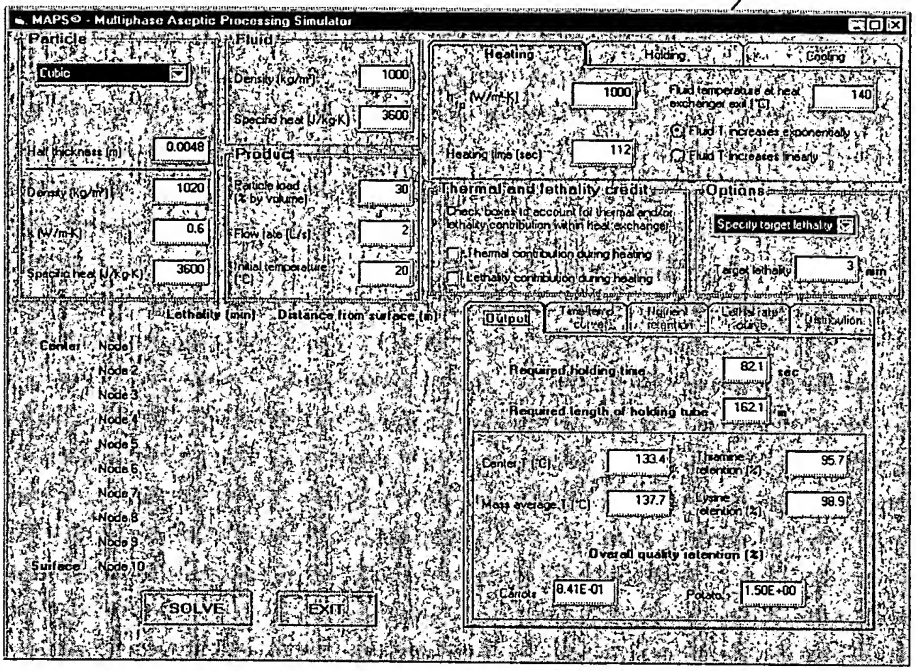


FIG. 53

Potato
3/8 in.

5400

A ← 4.8 mm → B

23.2	23.6	24.4	25.8	27.7	30.3	33.8	38.7	45.7	56.2
14.8	15.1	15.8	16.9	18.6	20.8	24.0	28.5	35.2	45.7
10.2	10.5	11.1	12.0	13.4	15.4	18.2	22.3	28.5	38.7
7.5	7.7	8.2	9.0	10.2	12.0	14.5	18.2	24.0	33.8
5.8	6.0	6.4	7.1	8.1	9.7	12.0	15.4	20.8	30.3
4.6	4.8	5.2	5.8	6.7	8.1	10.2	13.4	18.6	27.7
3.9	4.1	4.4	4.9	5.8	7.1	9.0	12.0	16.9	25.8
3.4	3.6	3.9	4.4	5.2	6.4	8.2	11.1	15.8	24.4
3.1	3.3	3.6	4.1	4.8	6.0	7.7	10.5	15.1	23.6
	3.1	3.4	3.9	4.6	5.8	7.5	10.2	14.8	23.2

4.8 mm

D C

5402

FIG. 54

TPX
3/8 in.
Time = 82.1 s
(Holding only)
$\alpha = 1.04 \times 10^{-7}$ m²/s

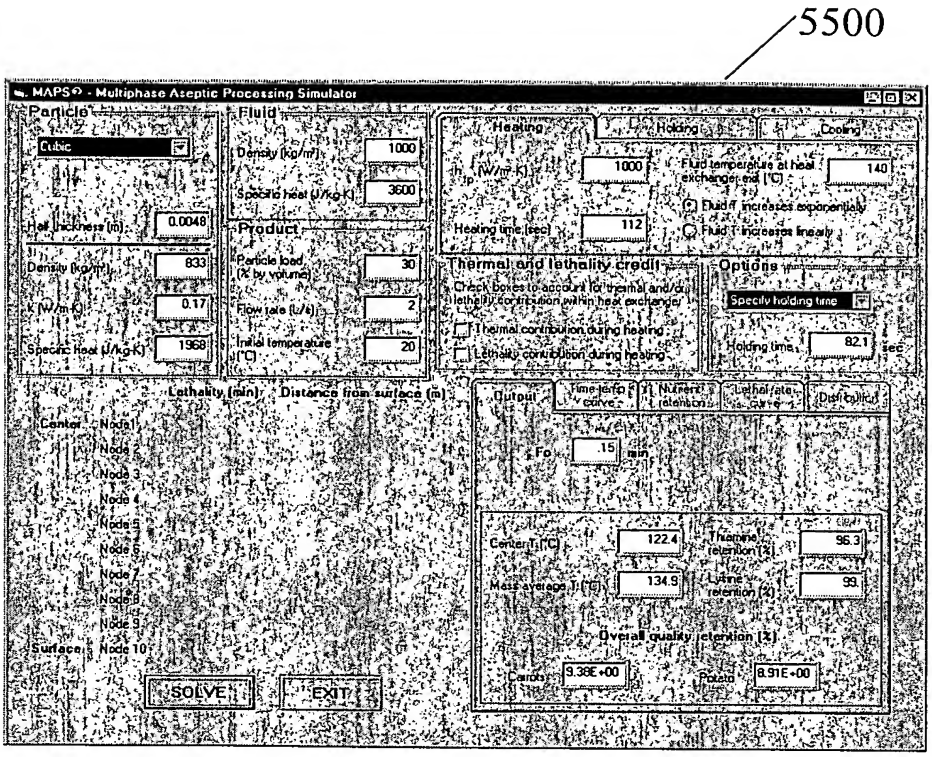


FIG. 55

TPX
3/8 in.

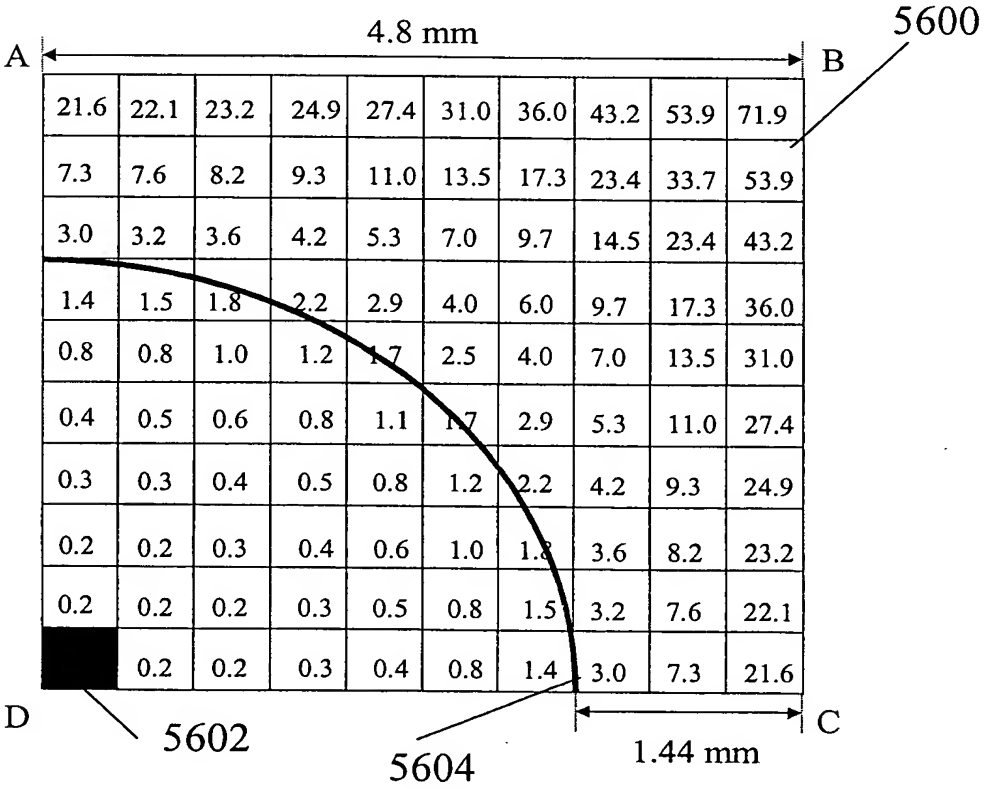


FIG. 56

Nylon
3/8 in.
Time = 82.1 s
(Holding only)
$\alpha = 1.40 \times 10^{-7}\ m^2/s$

5700

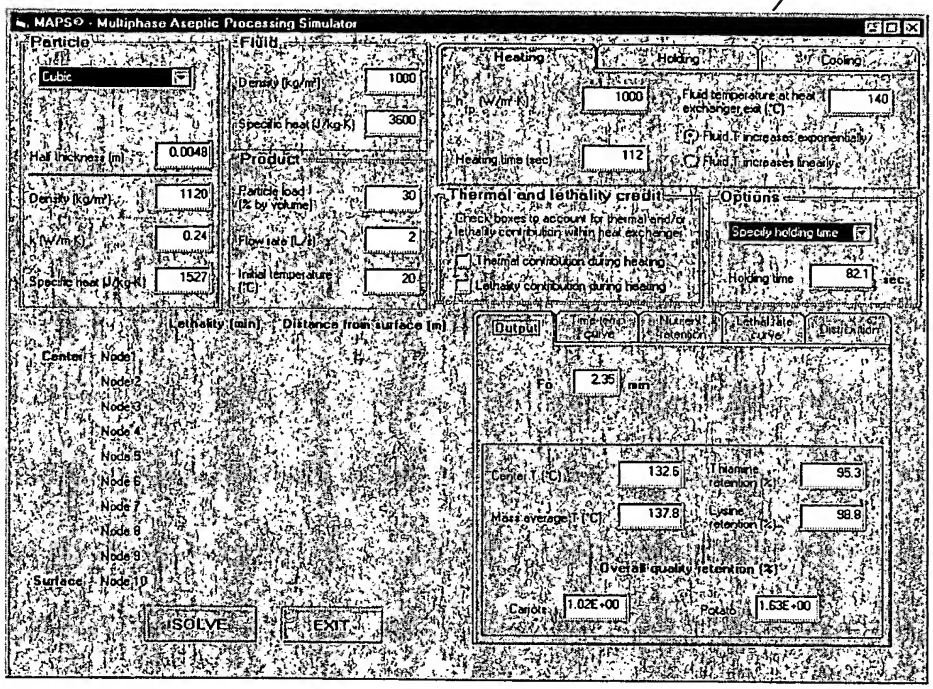


FIG. 57

Nylon
3/8 in.

5800

4.8 mm

A B C D

32.0	32.5	33.6	35.2	37.6	40.9	45.5	51.7	60.6	74.9
17.3	17.8	18.6	20.0	22.1	25.0	29.2	35.2	44.5	60.6
10.8	11.2	11.9	13.0	14.7	17.2	20.8	26.3	35.2	51.7
7.3	7.6	8.2	9.1	10.5	12.7	15.9	20.8	29.2	45.5
5.3	5.5	6.0	6.8	8.0	9.8	12.7	17.2	25.0	40.9
4.0	4.2	4.6	5.3	6.4	8.0	10.5	14.7	22.1	37.6
3.3	3.4	3.8	4.4	5.3	6.8	9.1	13.0	20.0	35.2
2.8	2.9	3.2	3.8	4.6	6.0	8.2	11.9	18.6	33.6
2.5	2.6	2.9	3.4	4.2	5.5	7.6	11.2	17.8	32.5
	2.5	2.8	3.3	4.0	5.3	7.3	10.8	17.3	32.0

5802

5804

3.84 mm

FIG. 58

Teflon
3/8 in.
Time = 82.1 s
(Holding only)
$\alpha = 1.15 \times 10^{-7}$ m²/s

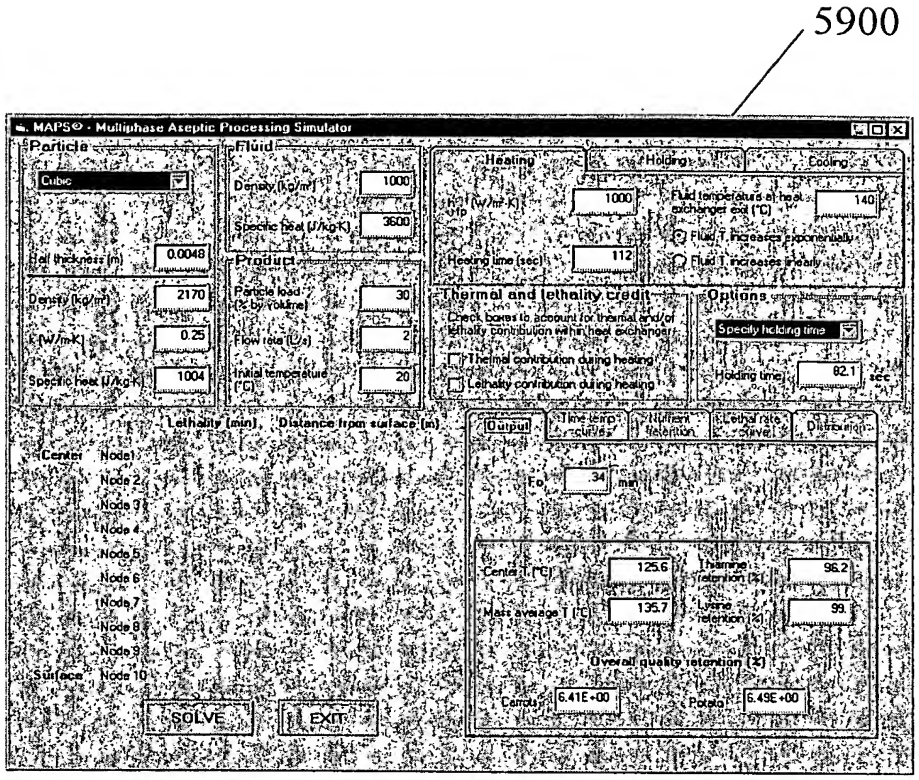
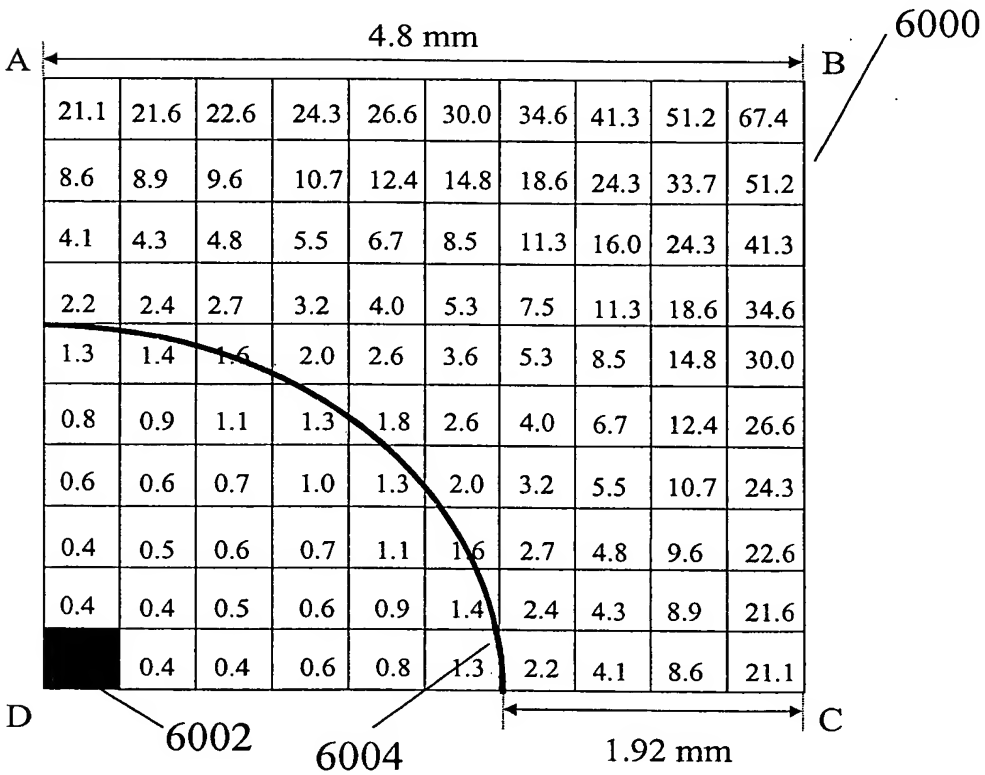


FIG. 59

Teflon
3/8 in.



21.1	21.6	22.6	24.3	26.6	30.0	34.6	41.3	51.2	67.4
8.6	8.9	9.6	10.7	12.4	14.8	18.6	24.3	33.7	51.2
4.1	4.3	4.8	5.5	6.7	8.5	11.3	16.0	24.3	41.3
2.2	2.4	2.7	3.2	4.0	5.3	7.5	11.3	18.6	34.6
1.3	1.4	1.6	2.0	2.6	3.6	5.3	8.5	14.8	30.0
0.8	0.9	1.1	1.3	1.8	2.6	4.0	6.7	12.4	26.6
0.6	0.6	0.7	1.0	1.3	2.0	3.2	5.5	10.7	24.3
0.4	0.5	0.6	0.7	1.1	1.6	2.7	4.8	9.6	22.6
0.4	0.4	0.5	0.6	0.9	1.4	2.4	4.3	8.9	21.6
	0.4	0.4	0.6	0.8	1.3	2.2	4.1	8.6	21.1

FIG. 60

Polypropylene
3/8 in.
Time = 82.1 s
(Holding only)
$\alpha = 6.10 \times 10^{-8}$ m²/s

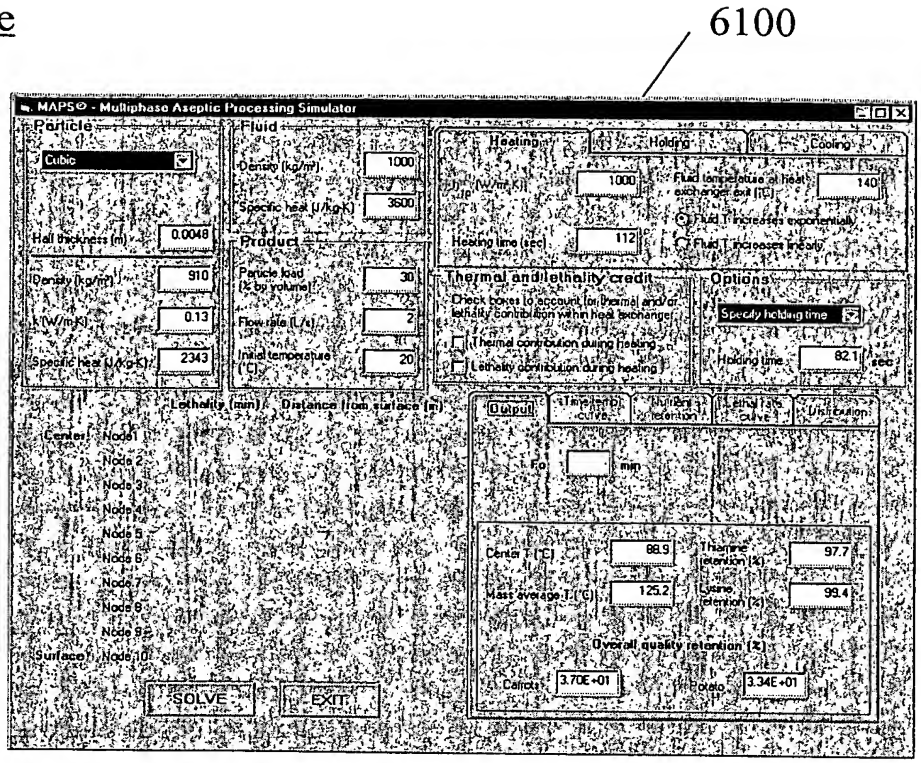
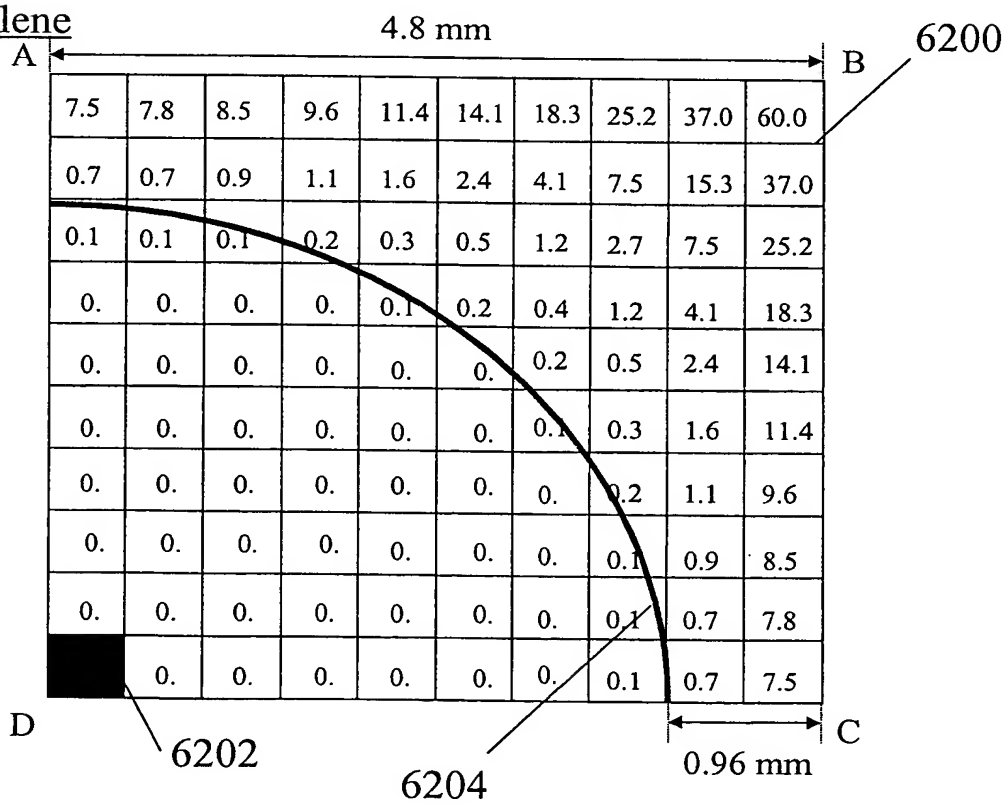


FIG. 61

Polypropylene
3/8 in.



7.5	7.8	8.5	9.6	11.4	14.1	18.3	25.2	37.0	60.0
0.7	0.7	0.9	1.1	1.6	2.4	4.1	7.5	15.3	37.0
0.1	0.1	0.1	0.2	0.3	0.5	1.2	2.7	7.5	25.2
0.	0.	0.	0.	0.1	0.2	0.4	1.2	4.1	18.3
0.	0.	0.	0.	0.	0.	0.2	0.5	2.4	14.1
0.	0.	0.	0.	0.	0.	0.1	0.3	1.6	11.4
0.	0.	0.	0.	0.	0.	0.	0.2	1.1	9.6
0.	0.	0.	0.	0.	0.	0.	0.1	0.9	8.5
0.	0.	0.	0.	0.	0.	0.	0.1	0.7	7.8
	0.	0.	0.	0.	0.	0.	0.1	0.7	7.5

FIG. 62

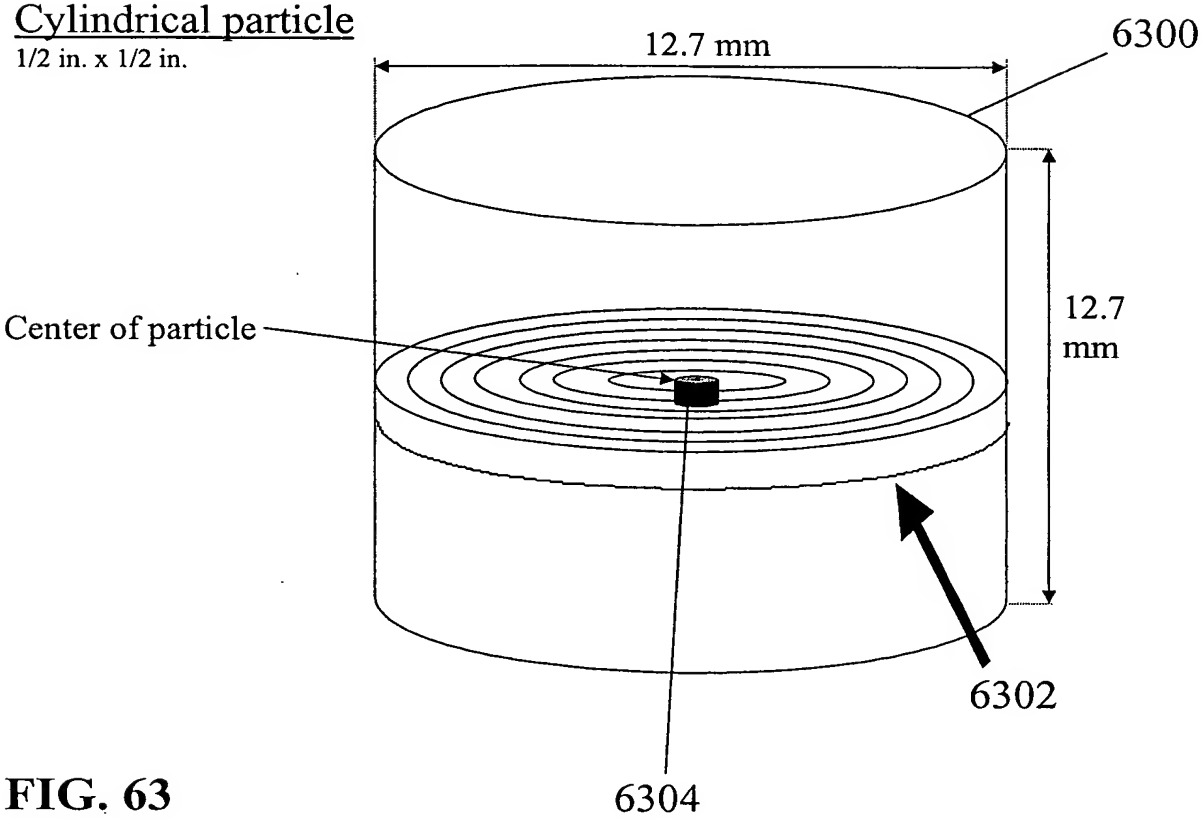

Cylindrical particle
1/2 in. x 1/2 in.
12.7 mm
6300
12.7
mm
Center of particle
6302
6304

FIG. 63

Potato
1/2 in. x 1/2 in.
F_0 (center) = 3 min.
Time = 120.5 s
(Holding only)
$\alpha = 1.63 \times 10^{-7}\ m^2/s$

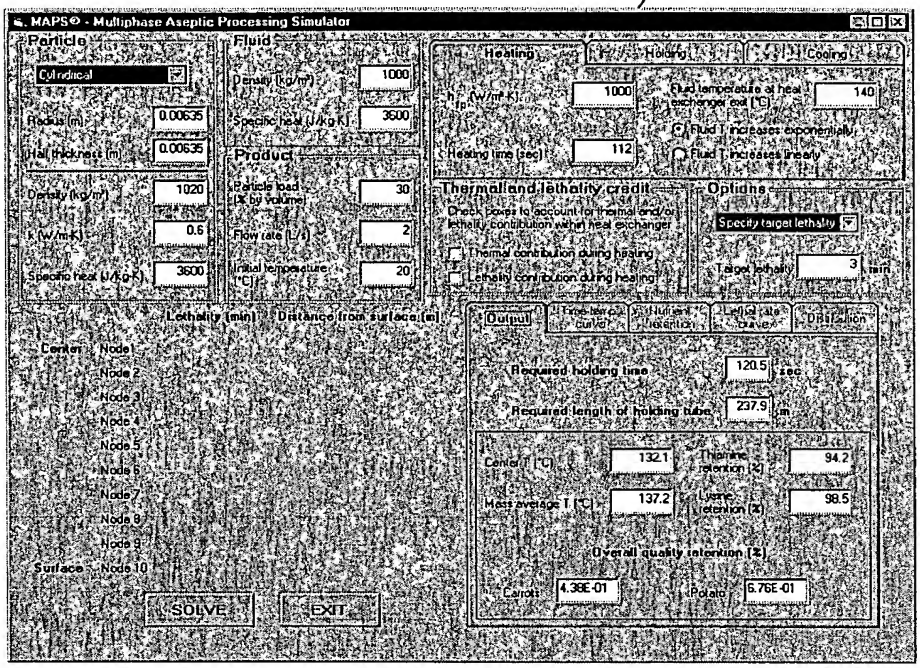


FIG. 64

Potato
1/2 in. x 1/2 in.

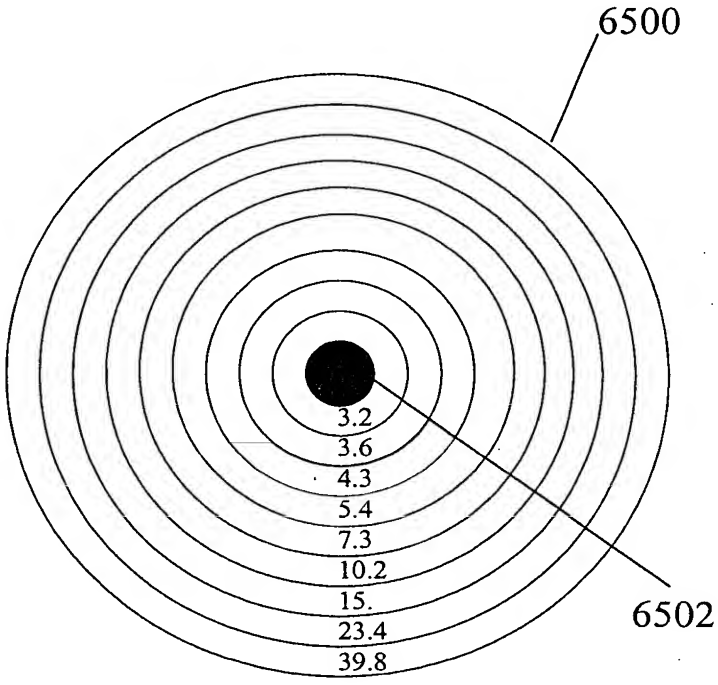


FIG. 65

TPX
1/2 in. x 1/2 in.
Time = 120.5 s
(Holding only)
$\alpha = 1.04 \times 10^{-7}$ m²/s

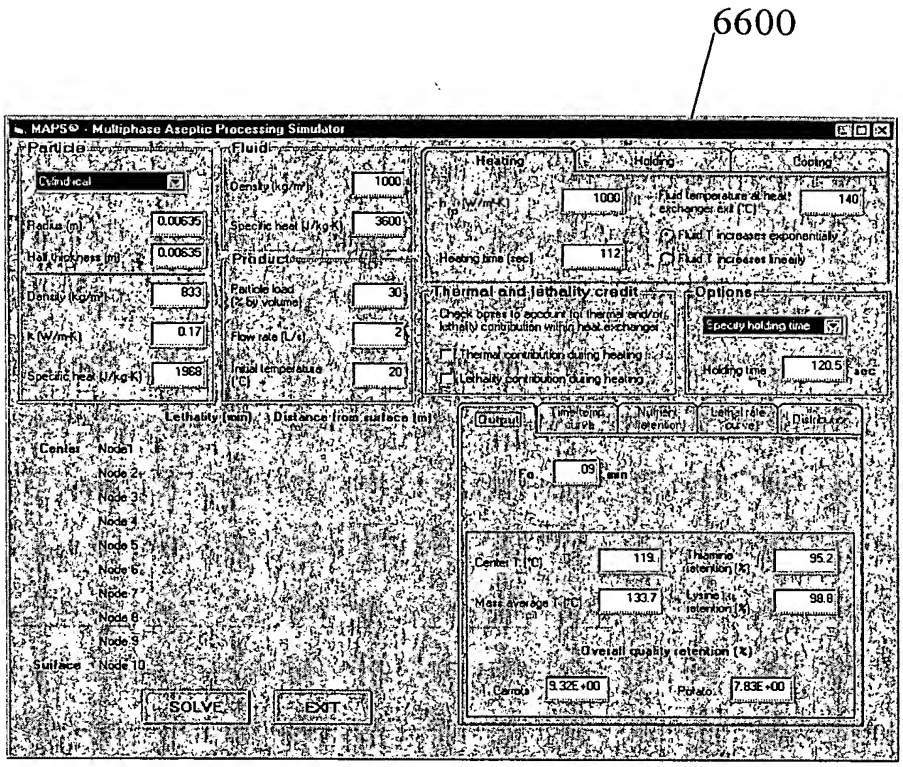


FIG. 66

TPX
1/2 in. x 1/2 in.

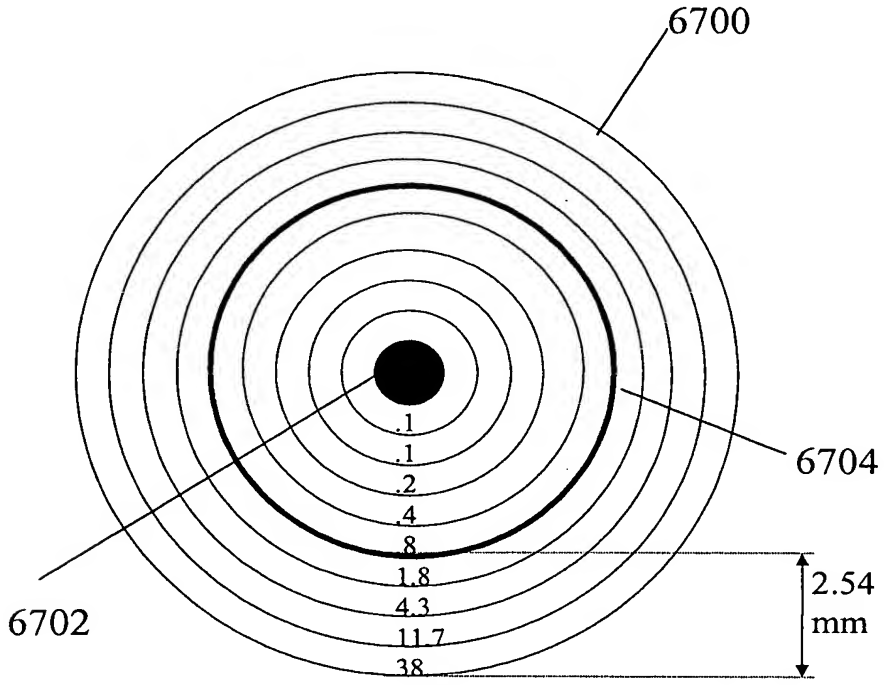


FIG. 67

Nylon
1/2 in. x 1/2 in.
Time = 120.5 s
(Holding only)
$\alpha = 1.40 \times 10^{-7}$ m²/s

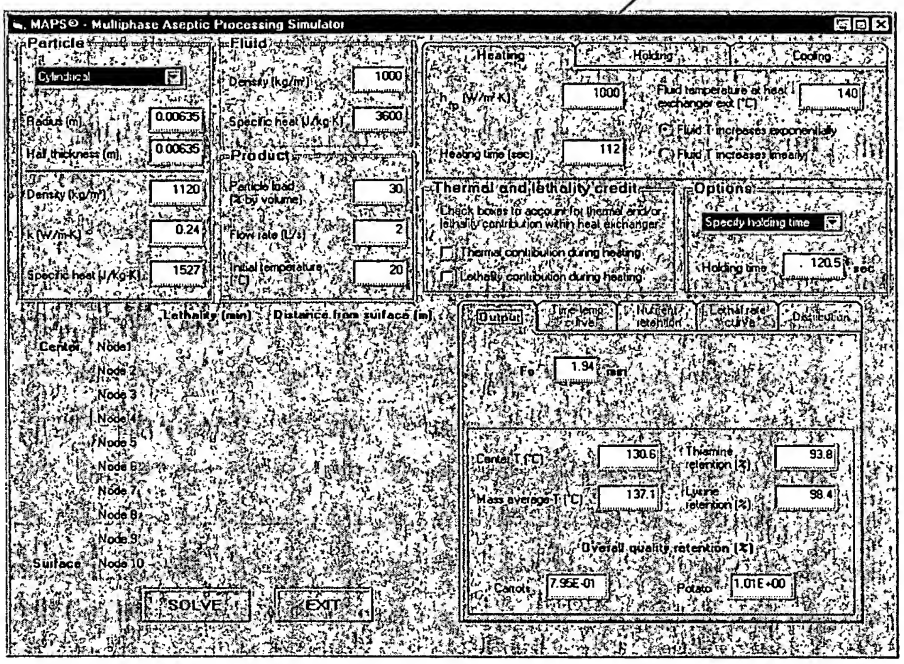


FIG. 68

Nylon
1/2 in. x 1/2 in.

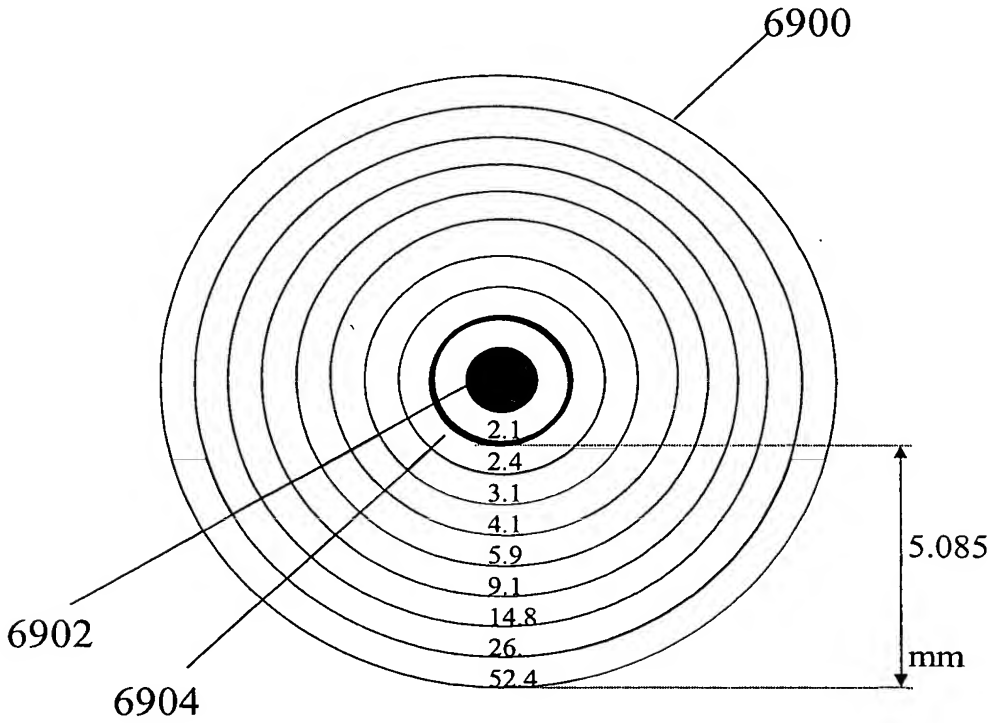


FIG. 69

Teflon
1/2 in. x 1/2 in.
Time = 120.5 s
(Holding only)
$\alpha = 1.15 \times 10^{-7}$ m²/s

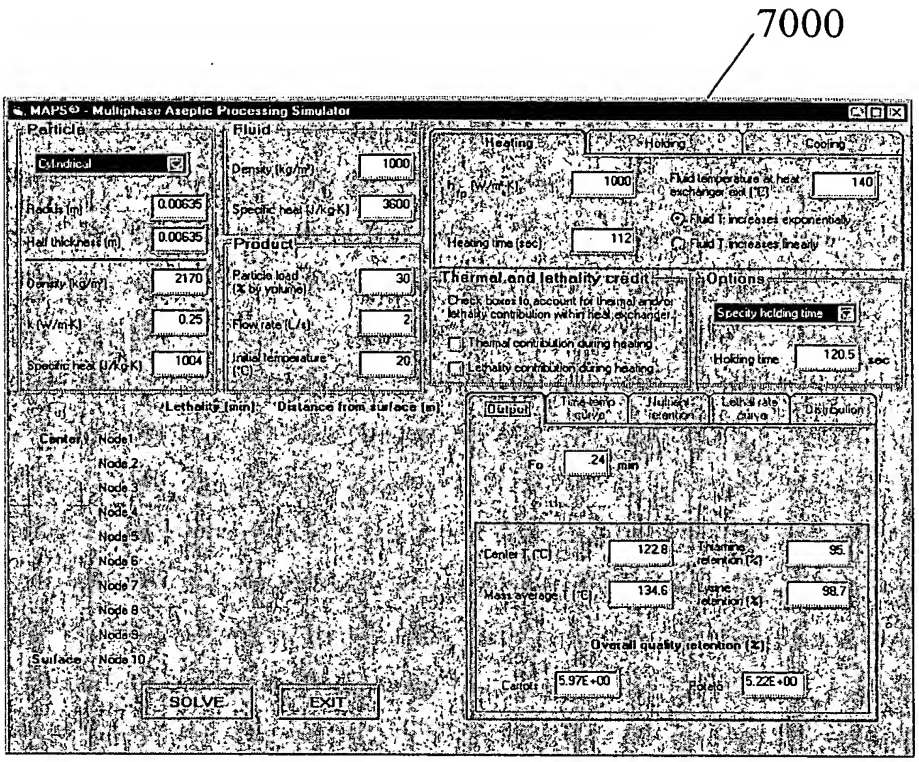


FIG. 70

Teflon
1/2 in. x 1/2 in.

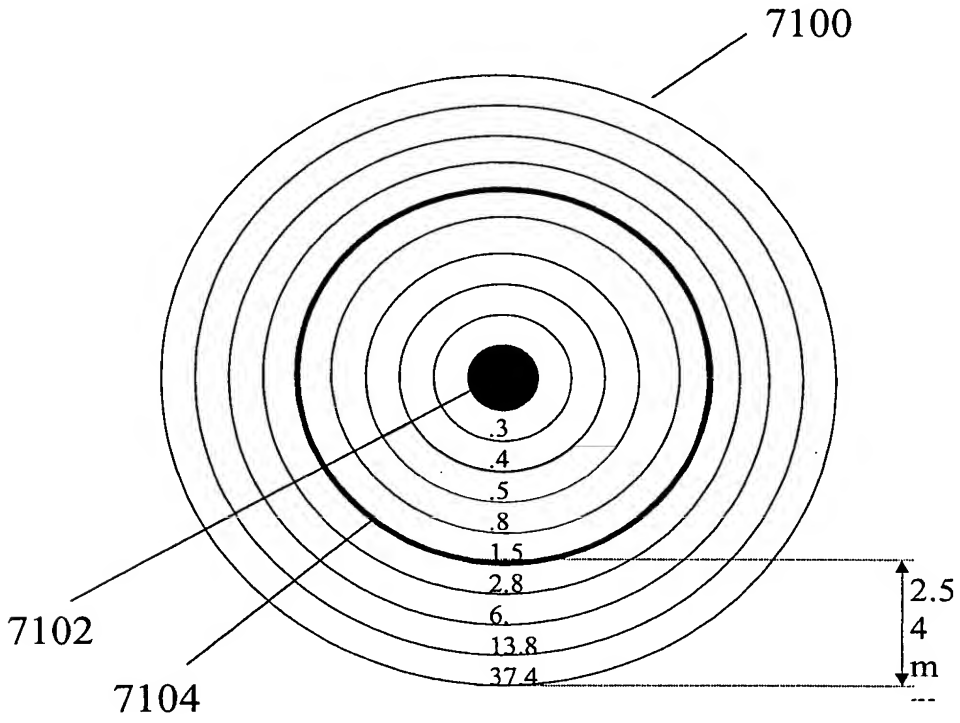


FIG. 71

Polypropylene
1/2 in. x 1/2 in.
Time = 120.5 s
(Holding only)
$\alpha = 6.10 \times 10^{-8}$ m²/s

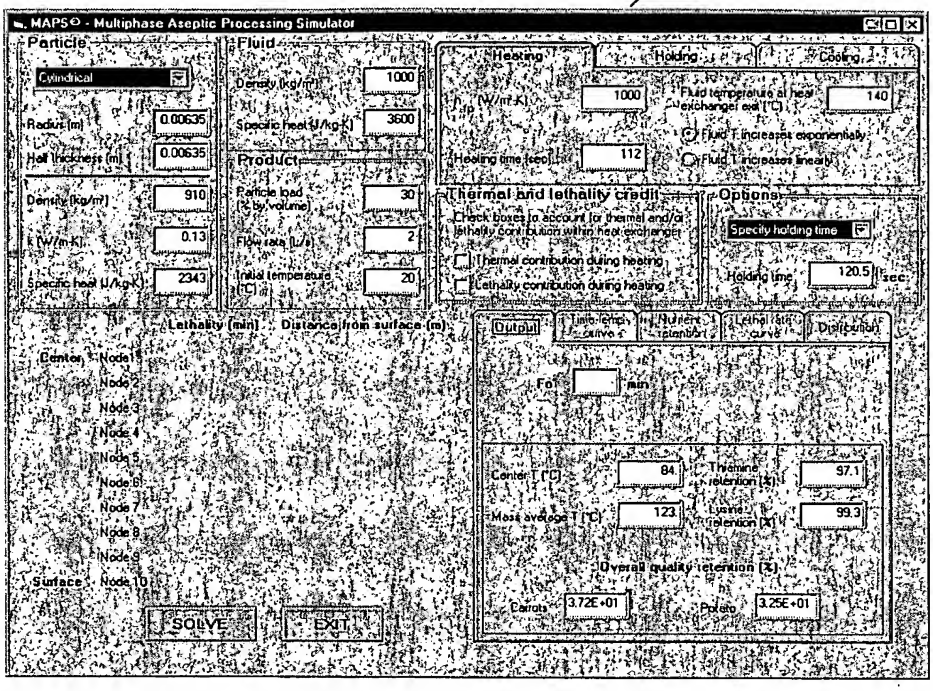


FIG. 72

Polypropylene
1/2 in. x 1/2 in.

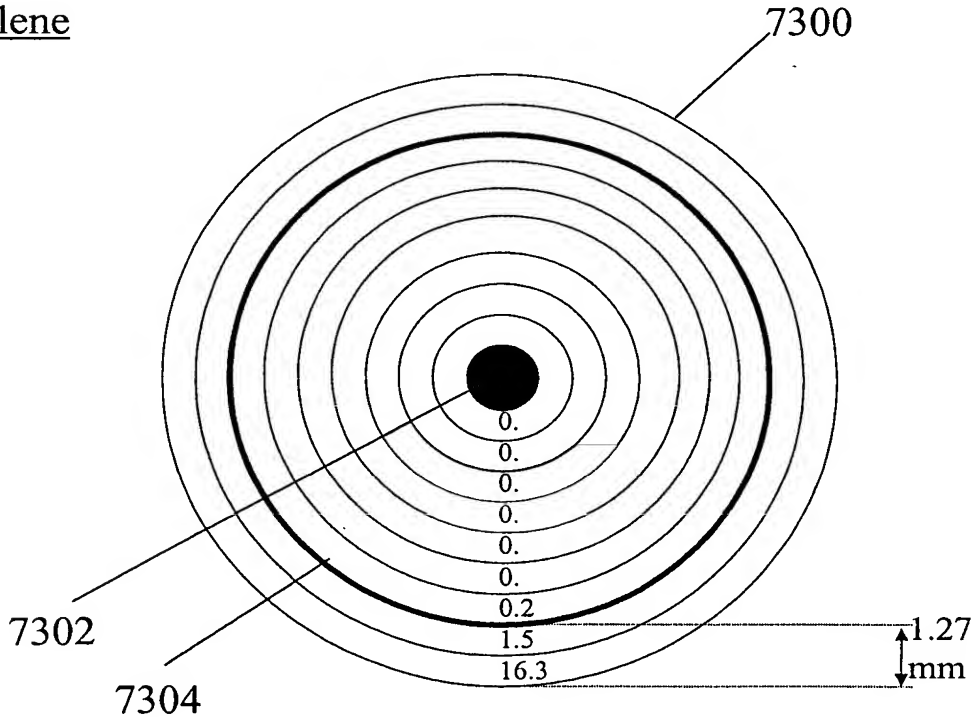


FIG. 73

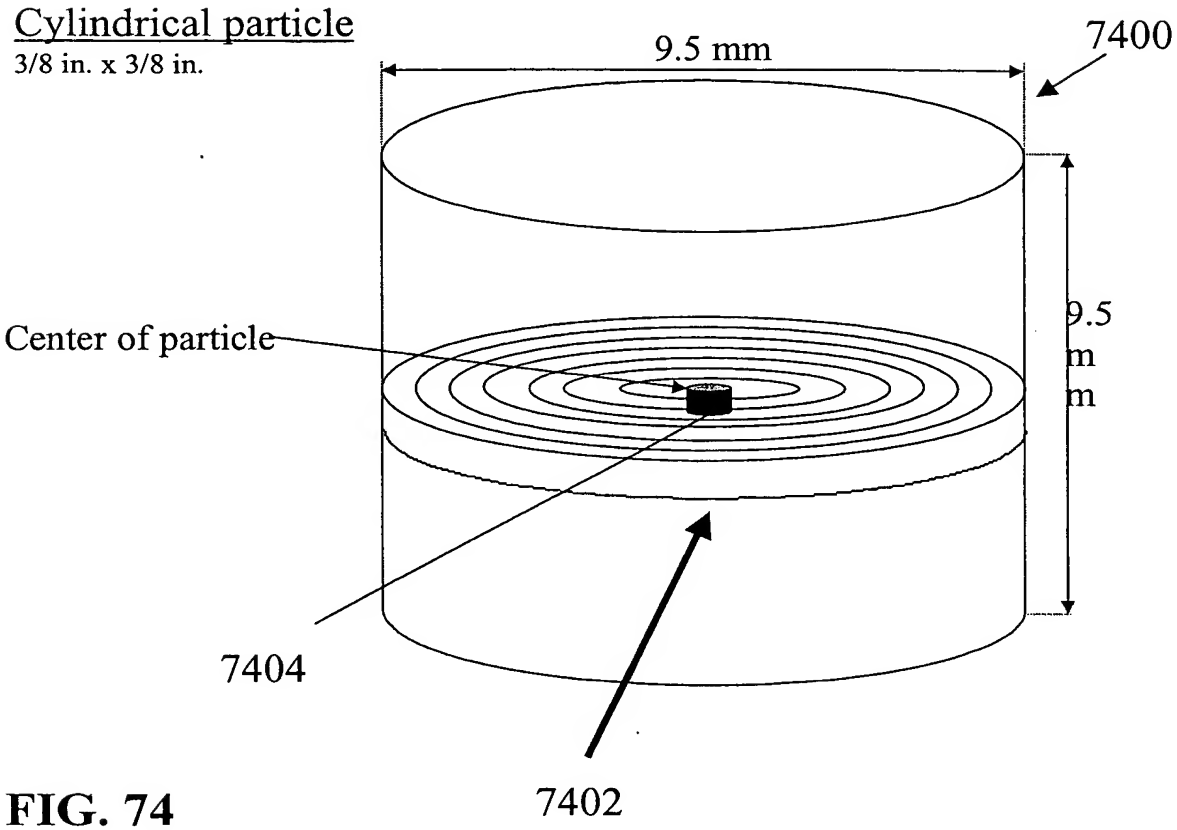

Cylindrical particle
3/8 in. x 3/8 in.
9.5 mm
7400
9.5 mm
Center of particle
7404
7402

FIG. 74

Potato
3/8 in. x 3/8 in.
F_0 (center) = 3 min.
Time = 76.0 s
(Holding only)
$\alpha = 1.63 \times 10^{-7} m^2/s$

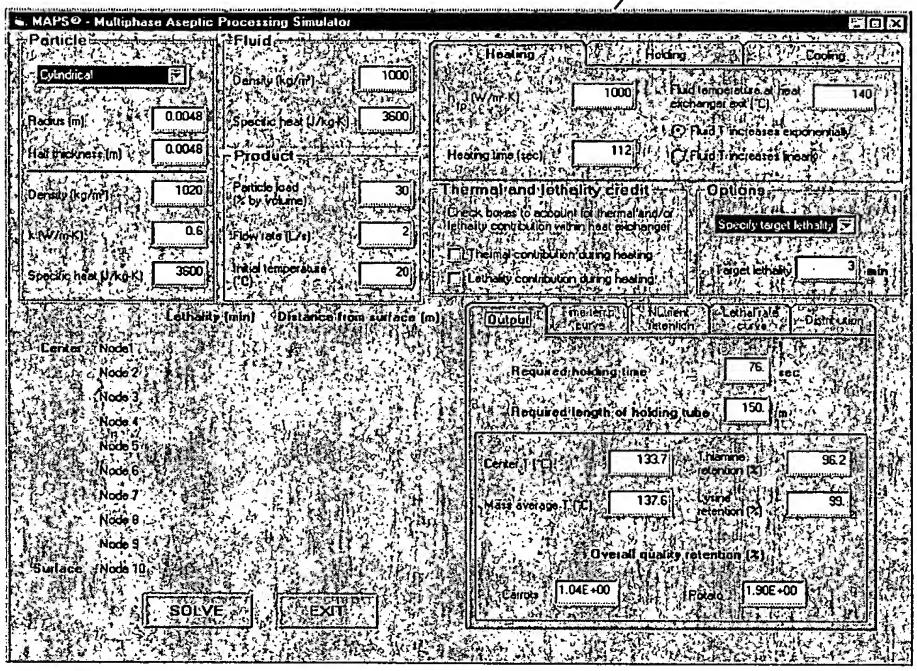


FIG. 75

Potato
3/8 in. x 3/8

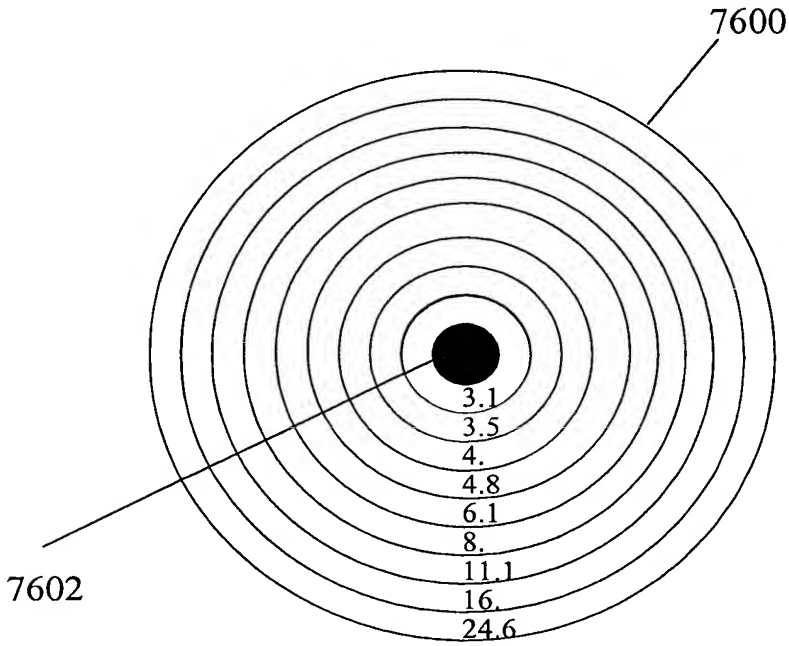


FIG. 76

TPX
3/8 in. x 3/8 in.
Time = 76.0 s
(Holding only)
$\alpha = 1.04 \times 10^{-7}$ m²/s

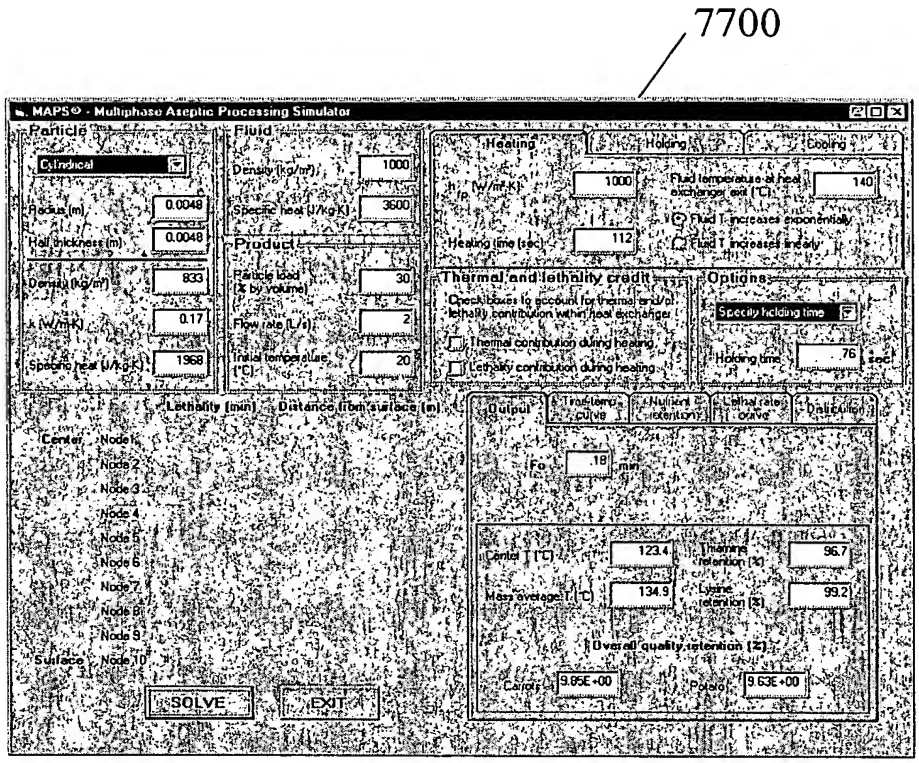


FIG. 77

TPX
3/8 in. x 3/8 in.

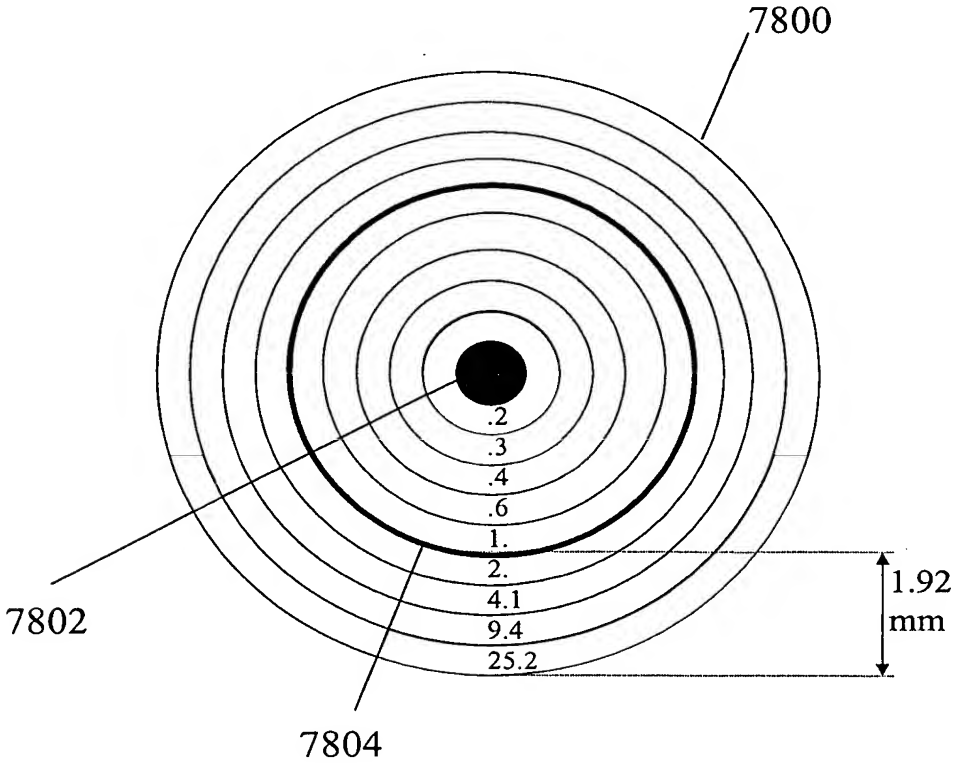


FIG. 78

Nylon
3/8 in. x 3/8 in.
Time = 76.0 s
(Holding only)
$\alpha = 1.40 \times 10^{-7}\ m^2/s$

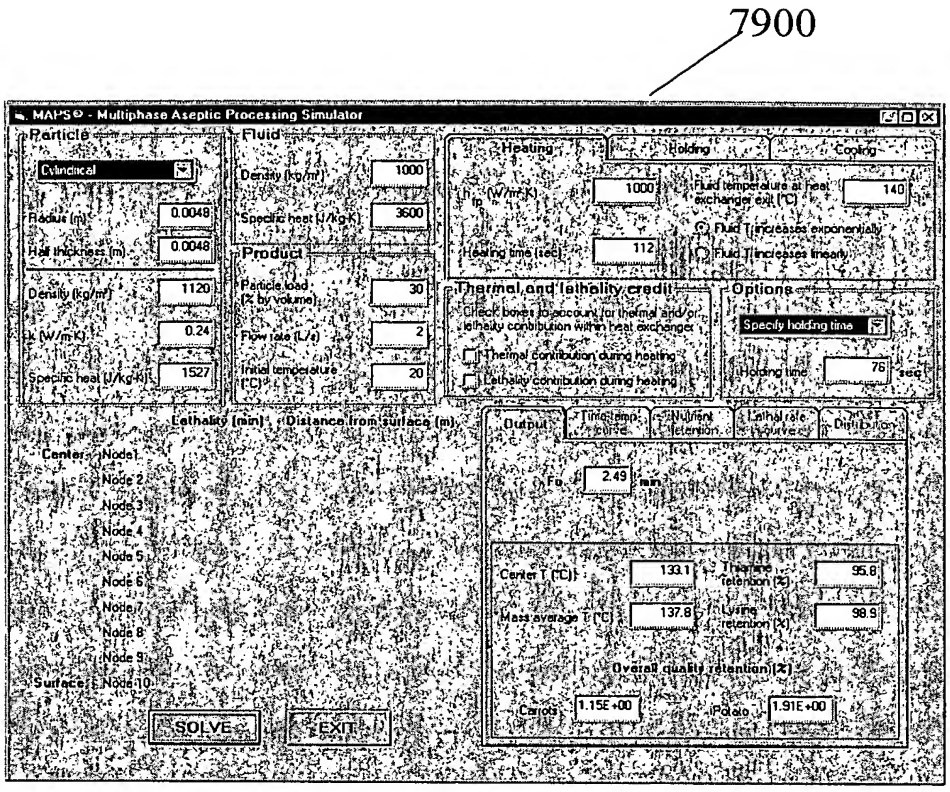


FIG. 79

Nylon
3/8 in. x 3/8 in.

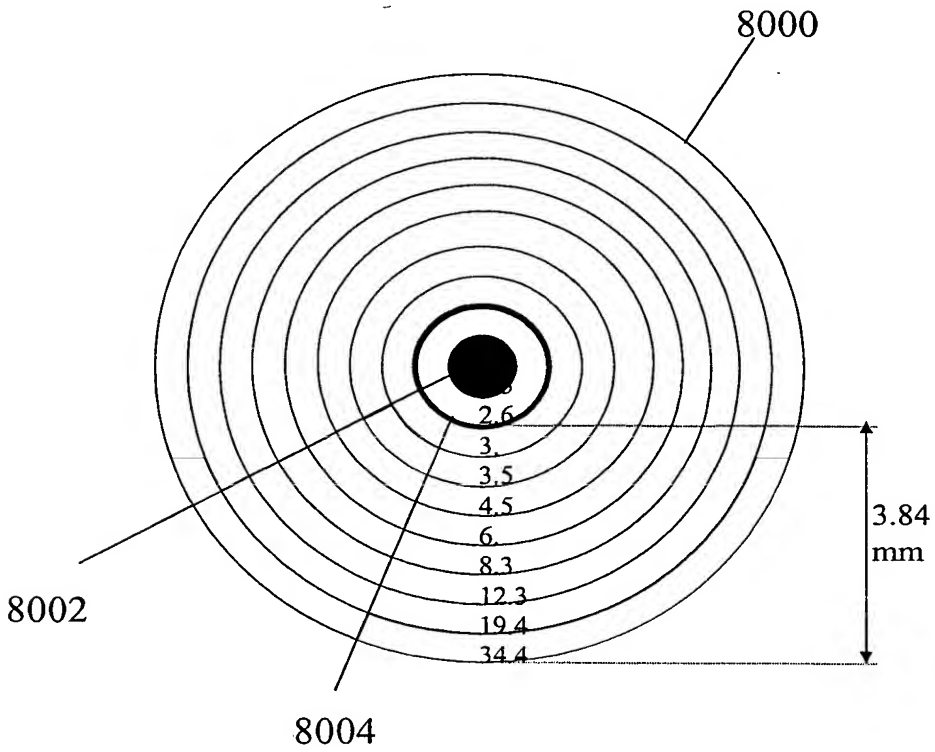


FIG. 80

Teflon
3/8 in. x 3/8 in.
Time = 76.0 s
(Holding only)
$\alpha = 1.15 \times 10^{-7}$ m²/s

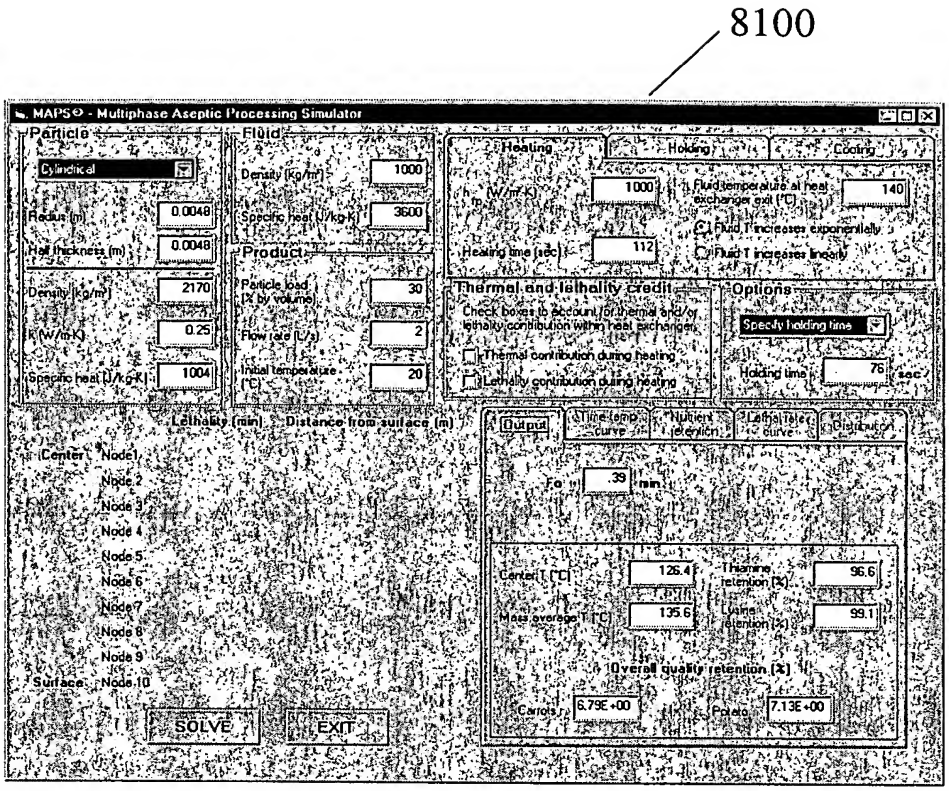


FIG. 81

Teflon
3/8 in. x 3/8 in.

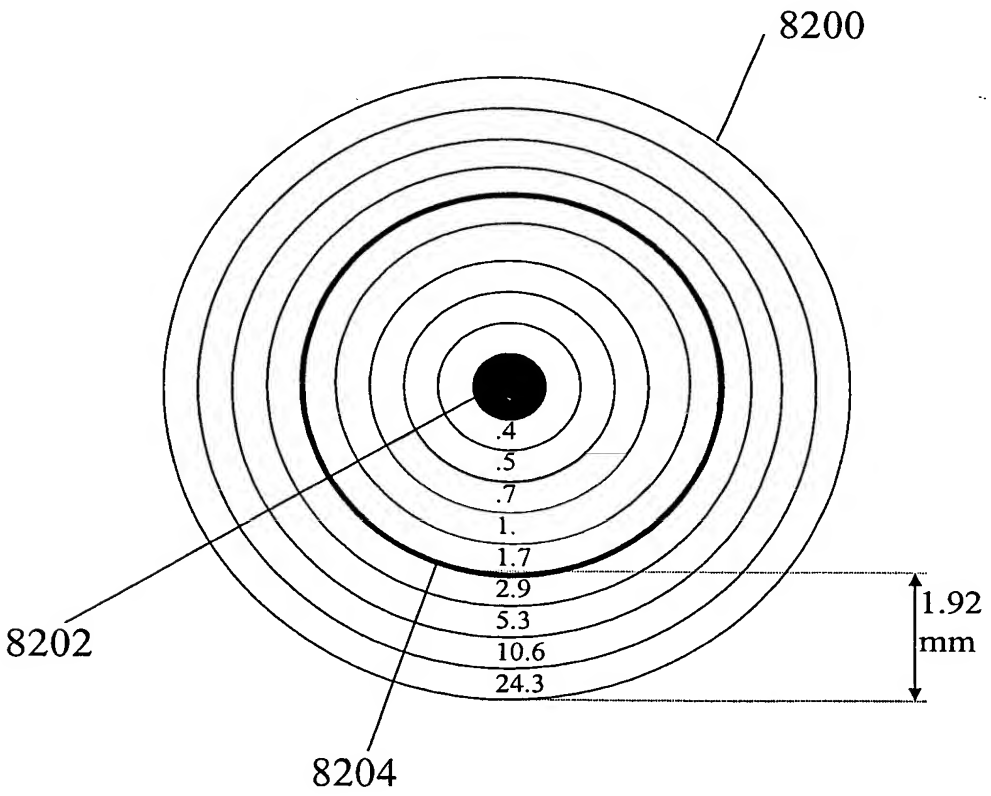


FIG. 82

Polypropylene
3/8 in. x 3/8 in.
Time = 76.0 s
(Holding only)
$\alpha = 6.10 \times 10^{-8}\ m^2/s$

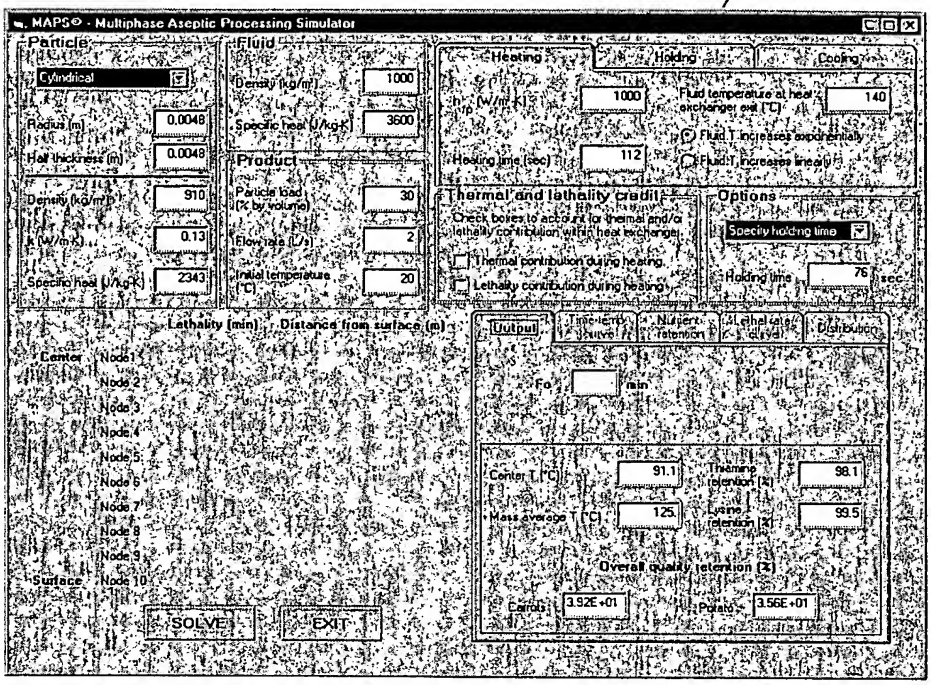


FIG. 83

Polypropylene
3/8 in. x 3/8 in.

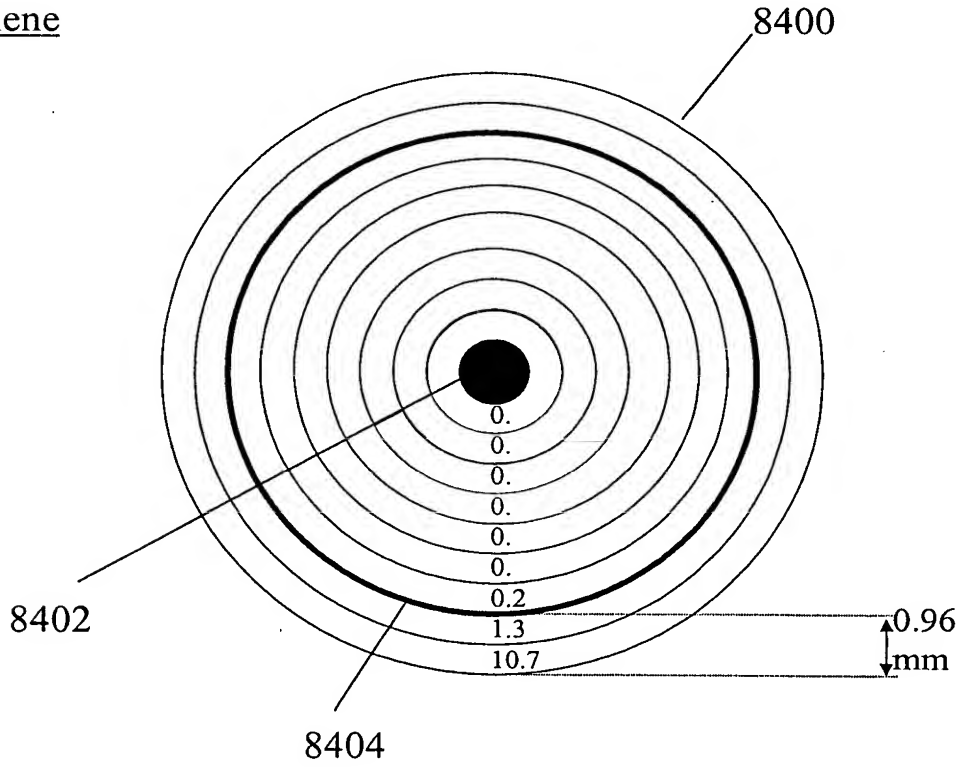
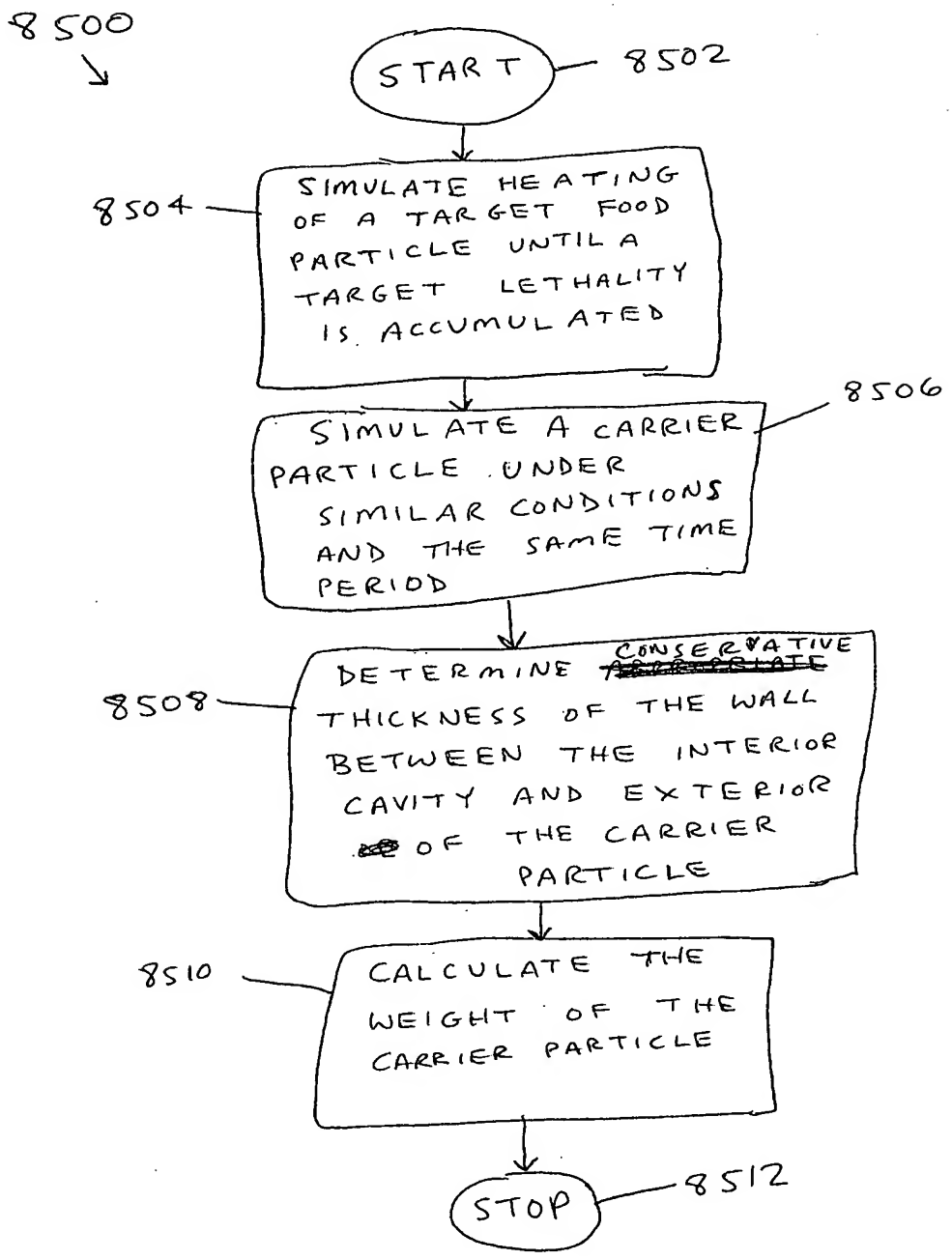


FIG. 84

FIG. 85


8500
START
8502
SIMULATE HEATING OF A TARGET FOOD PARTICLE UNTIL A TARGET LETHALITY IS ACCUMULATED
8504
SIMULATE A CARRIER PARTICLE UNDER SIMILAR CONDITIONS AND THE SAME TIME PERIOD
8506
DETERMINE CONSERVATIVE THICKNESS OF THE WALL BETWEEN THE INTERIOR CAVITY AND EXTERIOR OF THE CARRIER PARTICLE
8508
CALCULATE THE WEIGHT OF THE CARRIER PARTICLE
8510
STOP
8512

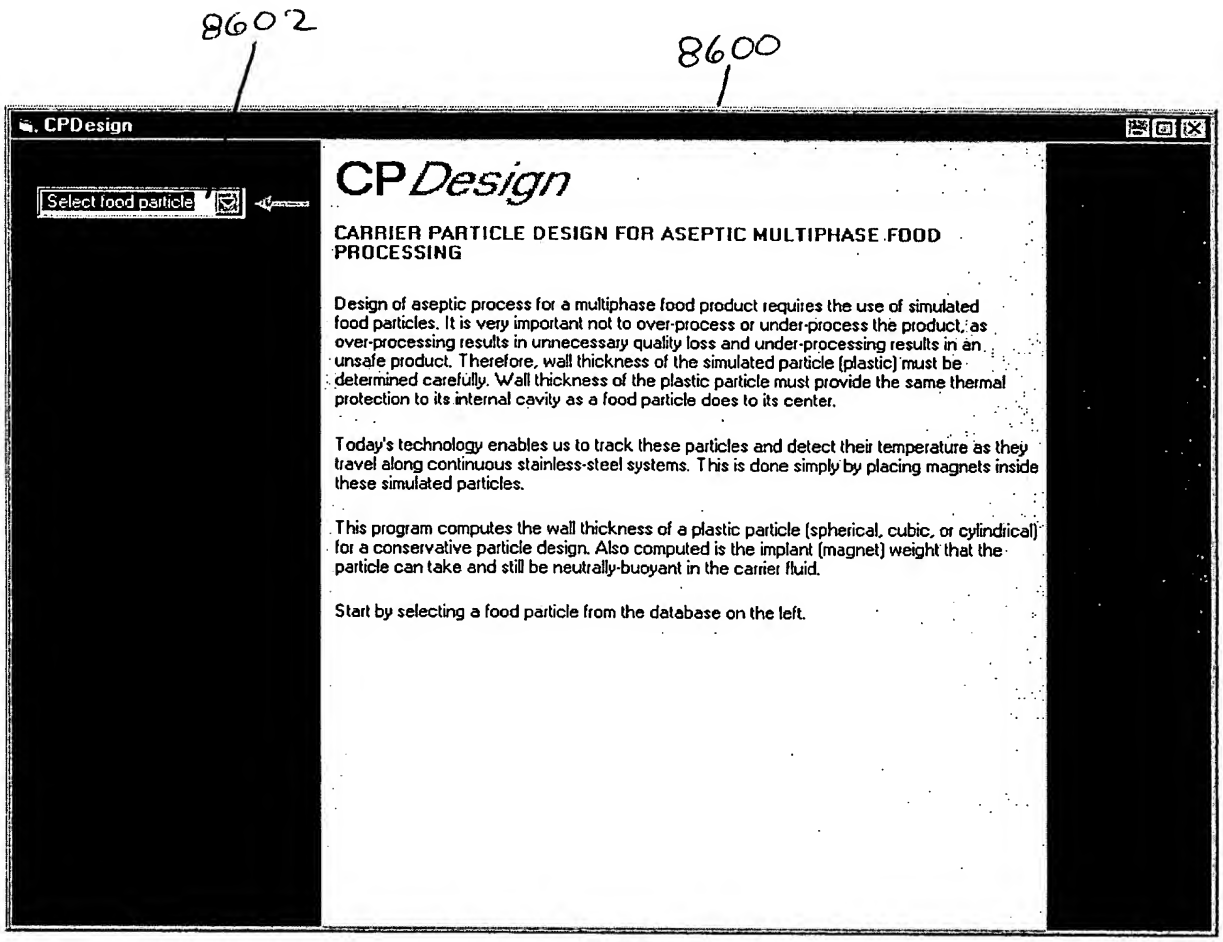


FIG. 86

8700

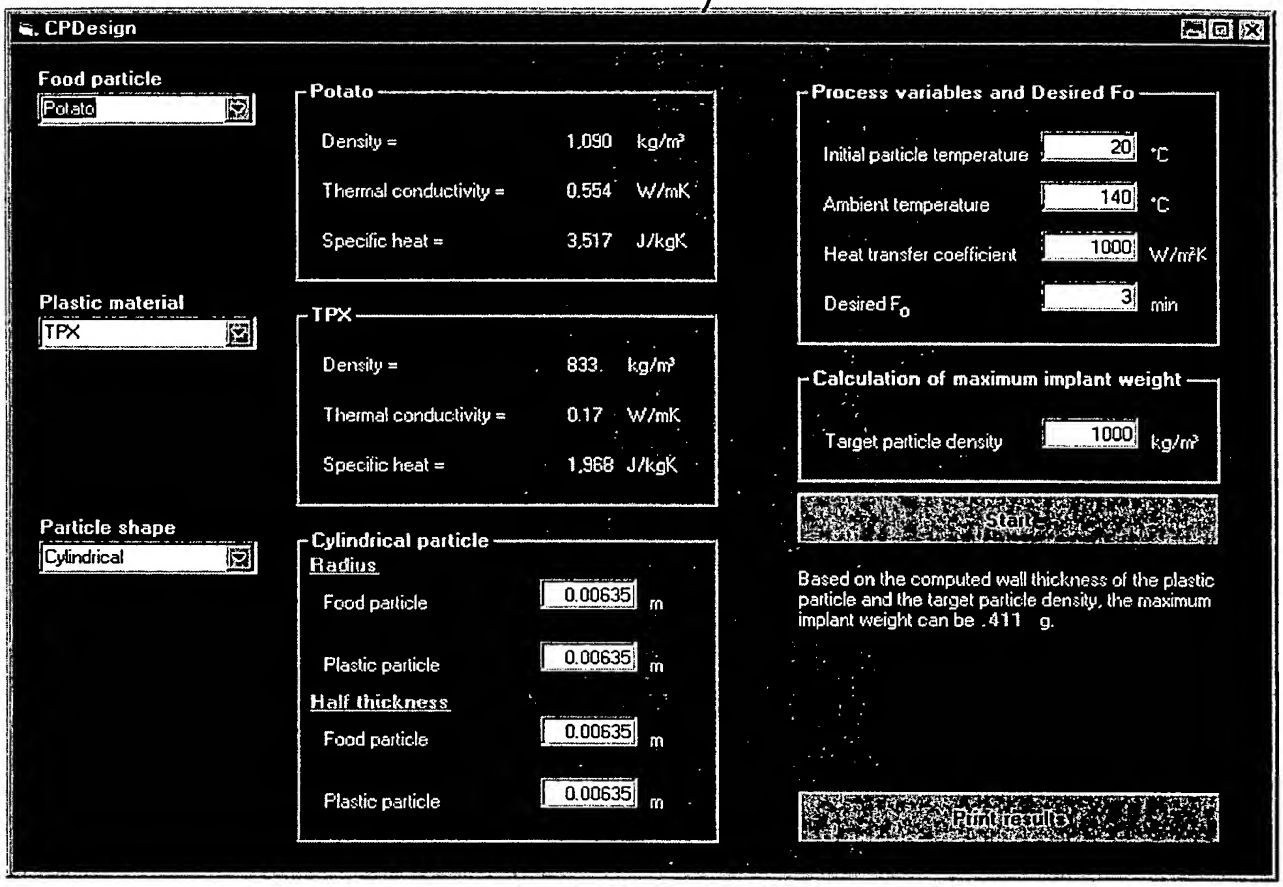


FIG. 87

8800

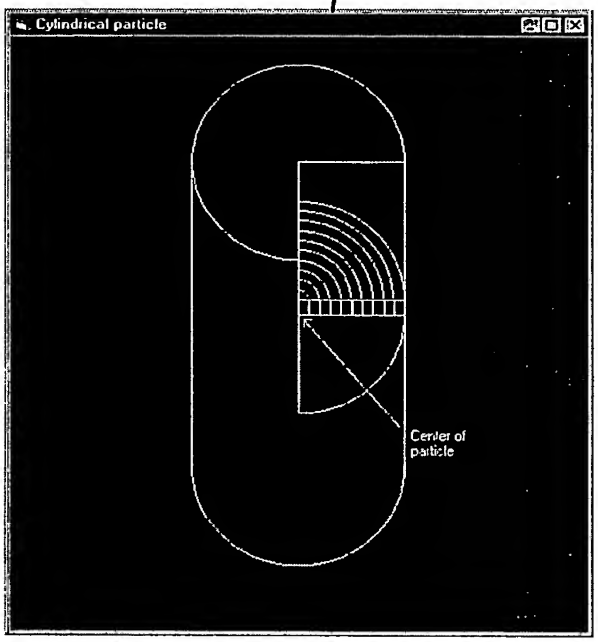
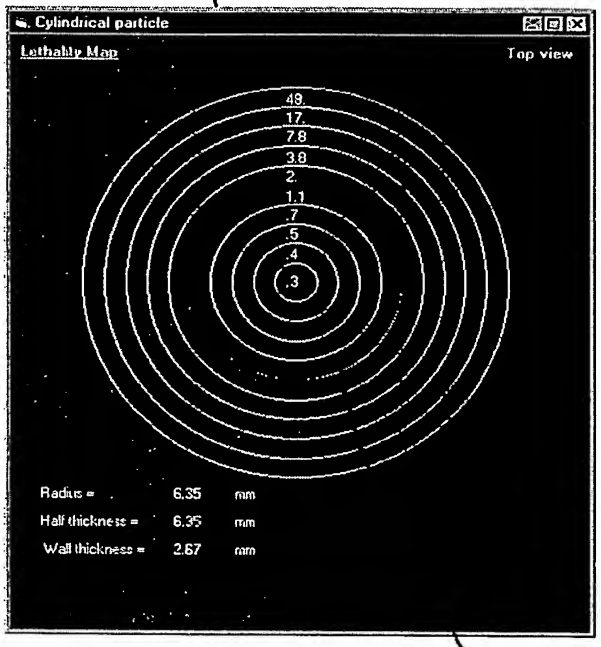


FIG. 88A

8802



8804

FIG. 88B

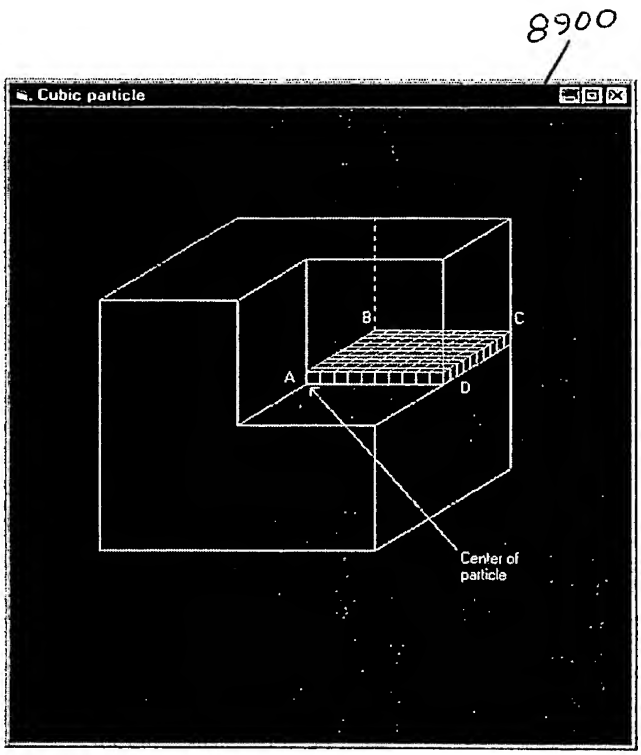


FIG. 89A

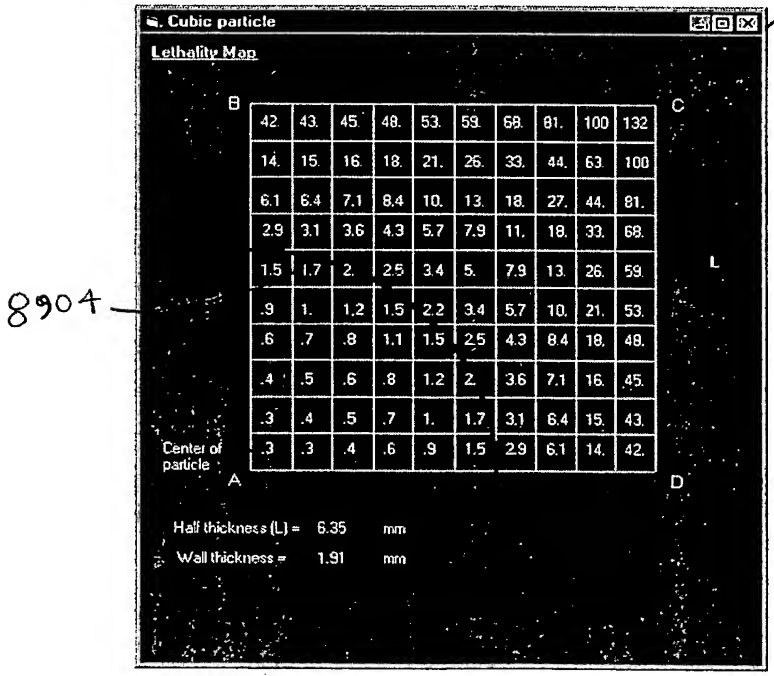


FIG. 89B

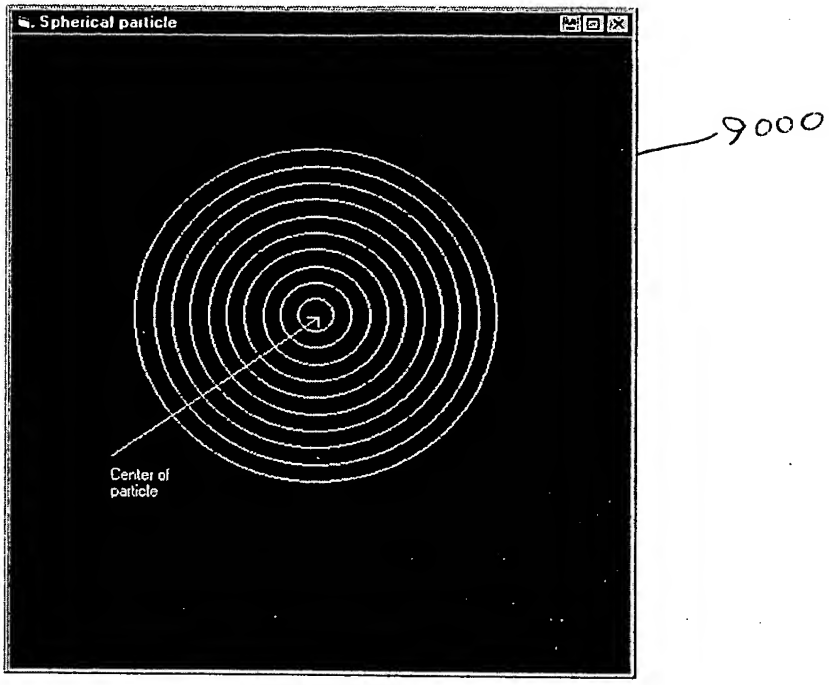


FIG. 90A

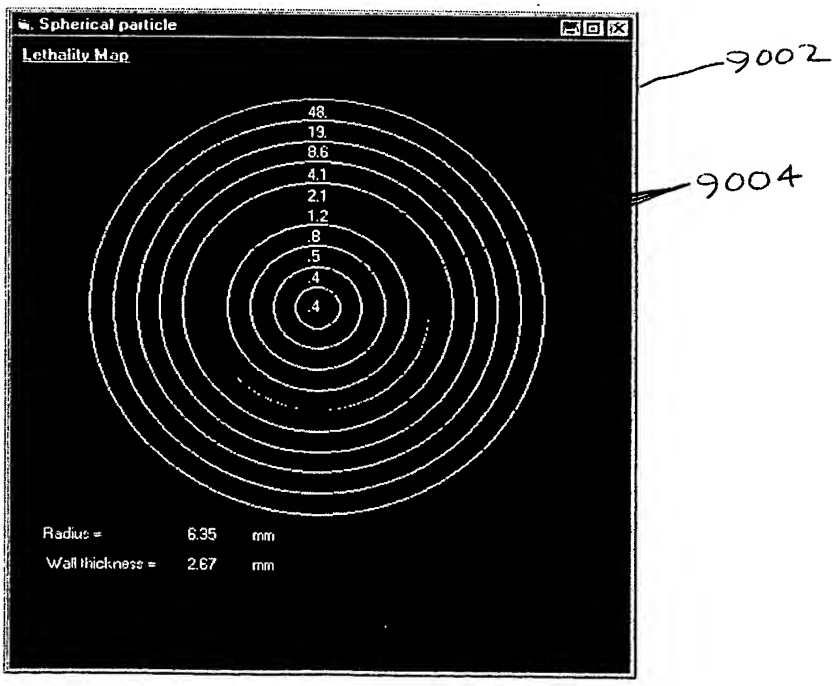


FIG. 90B